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MY TOUR IN EASTERN RUBBER LANDS.

BY

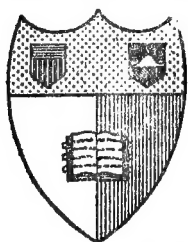
HERBERT WRIGHT, Assoc. R.C.S., F.L.S.

LONDON :

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Photo by]

[Chas. Northway.

Old method of platform tapping on a Kalutara estate.

MY TOUR IN EASTERN RUBBER LANDS

BY

HERBERT WRIGHT, Assoc.R.C.S., F.L.S.

*(Author of "Hevea brasiliensis: Its Botany, Cultivation,
Chemistry and Diseases," and Editor of "The India-
Rubber Journal.")*

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PREFACE.

During the early part of the present year the author had the pleasure of visiting the islands of Ceylon, Java and Sumatra, and inspecting rubber plantations in the Straits Settlements and Federated Malay States. The object of the tour was to gain a correct idea of the condition of the rubber plantation industry in the areas specified in order that manufacturers, investors and planters throughout the world would be able from the information published in *THE INDIA-RUBBER JOURNAL*, to see what was really going on in the Indo-Malayan region.

The extra copies of the journal in which the original matter first appeared having been exhausted, and requests from correspondents having been made for the information thus given, it was decided to issue the articles in book form.

The present publication will, it is hoped, impress upon all who read it the importance of the new Eastern industry, and assist them in their endeavours to utilise the opportunities which that development affords.

H. W.

September 10th, 1908.

My Tour in Eastern Rubber Lands.

Free on board once more! For the fifth time I am facing the Red Sea, but on this occasion there is a prospect of getting back to the old country after a short business holiday. That condition makes all the difference in the world! It is one thing sailing to the tropics for a future home; it is quite another matter journeying there to spend a few pleasant months, to renew old acquaintances, and watch other people work.

This trip is being made to ascertain the present position of the Eastern rubber-growing industry on the spot, to collect and publish data which will give all readers some idea of what is really happening in the East, and to note the trend of events, so that manufacturers and investors intimately associated with the raw product may form their own opinion of the promised new sources of supply. These notes must, until I arrive in the tropics, be of a light, disconnected nature; when I am in the heart of the new rubber country my readers might as well hope for better and more informing matter.

Rubber Brokers and the Plantation Industry.

If the plantation industry is half the success which people in responsible positions opine it will be, there will be many changes to chronicle in relation to markets both in tropical and temperate zones. New centres of distribution must spring up as a result of the cultivation in Ceylon, Malaya, Sumatra, Java, and Borneo since these countries have, almost without exception, hitherto been of no real commercial importance as exporters of raw Para rubber. Furthermore, if, as some leading members of the India-Rubber Manufacturers' Association inform us, there will be an undoubted preference for Para once

the cultivated estates can supply it at 2s. 6d. per lb., the present importance of African sorts, and even some American kinds, will not be maintained. Now, it is fairly well known that the majority of British rubber-growing companies in the East have arranged for the sale of their produce through London firms; very few Liverpool houses being represented in such concerns. The Eastern industry, in virtue of the acreage already planted with Para rubber trees, can certainly hope to turn out twice the quantity exported from the whole of Africa. We have therefore to face a probable export of cultivated Para second only in quantity to that from American ports, and a possible decline in many African and other medium sorts; this means that the London firms controlling the cultivated rubber supplies in the East will yearly become more important, and must ultimately draw away a large part of the trade from other English and Continental centres.

Rubberites on Board.

But I am digressing. I must first deal with the rubber influences on board. Previous remarks have indicated that the writer has always been fond of plants; my particular weakness has been in the way of microscopic analyses of parts of plants, and especially of those structures wherein products of commercial importance daily accumulate. The organization of motionless series of plant tissues is fascinating, even though it is so imperfectly understood. A study of the origin, structure and function of the milk channels in numerous rubber-yielding plants creates a feeling akin to fondness for such parts; the planter becomes quite attached to the trees which he has raised from seed, and tendered and examined at every period of their development. But, to the rubber business man on board the N.D.L. ss. "Prinz Eitel Friedrich" matters are viewed in quite another light. One passenger, so generously minded as to consider facts to be of doubtful value, explained a few ideas he had in mind regarding an estate he proposed to plant with rubber trees and subsequently sell to a company; when I asked him which species he intended growing, he quickly observed that he had no practical knowledge of

tropical plants, and did not really care whether they were black, blue, or pink, so long as they yielded rubber. I felt annoyed and disgusted. Having read somewhere that he must be a poor man who does not often repeat himself, I held forth to my companion on the characters and differences in requirements of various species at his command in most tropical lands. But of no avail. My exposition merely drew forth the remark: "How interesting"; I shall keep my eye on that youthful aspirant, and some day perhaps refresh myself with the details of his vari-coloured plantation.

Rubber Fever.

There are not many such passengers going eastward at the present time; a few are going out to settle down on plantations; others are on pleasure bent. There is one traveller who has obviously suffered from the ravages of that terrible "rubber fever." He has my sympathy. I am not referring to the feeling which overcomes one after seeing rubber sold at from 2s. 9d. to 3s. 8d., and sink to 3s. 2d. within a couple or so weeks, to the condition of the share snatcher as settling day approaches, nor to that from which most rubber planters sooner or later suffer. It is quite a fever of its own. I have suffered as much as the other man, and can well understand the necessity of a change of atmosphere. Since the day Mr. John Ferguson suggested I should write my "*Hevea brasiliensis*" I have suffered from rubber "nerves"; now that I am on board my eyes must wander to the tarpaulins, flooring, joints of all descriptions, and other people's footwear, to see where rubber comes in. Rubber becomes the standard against which all other articles must be compared; even to the toughness of the steak, the lurch of the ship, and the noiseless tread of the rope-soled boot; everything on land or sea must needs be compared with that goddess of commerce—rubber. Even my youngest son talks of rubber prices and shares. And now I am actually taking a holiday in the land where rubber trees grow. It is impossible to get away from it once you have dipped deeply. Within half an hour of leaving Holborn Viaduct for Dover my train companion, bound for Ceylon, discussed the subject of rubber plant-

ing; on the steamer an early acquaintance, hailing from Johore, after going into detailed accounts of the systems of tapping rubber trees, innocently advised me to read—my own book. I kept under cover until he brought me a copy of my own misery, when I considered the time opportune to offer an explanation.

However, I am living in the hope that a month of tossing waves and blue skies will work wonders.

Rubber Tiling on Steamers.

It will interest British rubber manufacturers to learn that nearly all the new N.D.L. steamers are being supplied with rubber tiling. The ss. "Kaiser Wilhelm der Grosse" was, according to information obtained from the steward, the first N.D.L. boat on which rubber tiling for floors was tried. The results have been so satisfactory that this, like other steamship companies, has decided to use more of it wherever practicable. I was told that the N.D.L. Company placed their first orders with an American firm, but that contracts are now being given to Bremen and Cologne houses. So far I have not been informed of any orders being placed with British firms by this line.

There is a fair amount of rubber tiling on the "Prinz Eitel Friedrich," the Gummifabrik Roland, Bremen, having laid down the present flooring some three to four years ago. The material has lasted well, there being no apparent wear even on the most frequently used floors; a bright and cheerful appearance is presented by the colouring and pattern adopted; cleanliness is easily and rapidly effected.

The floor of the smoking saloon is washed once, and that along the corridors, etc., three times every day. I imagine that the deposit of water is equivalent to a fairly respectable rainfall, but with this difference—the moisture is not allowed to soak in. There is not the amount of lifting or separation at the joints which one might at first expect, and the surface remains relatively level throughout.

The exact area which has been tiled is difficult to determine, but a few rough measurements were made. The smoking saloon has a floor space of about seven

by eight yards, and has a bright, attractive appearance. The hall leading to the dining room has a much larger floor space completely tiled; the entrance to the writing and reading room, to a few special cabins; and the corridors, each measuring about twenty-seven yards long, are lain in red and white blocks. The pattern is the same in all parts of the ship. The colouring is red and white, except in the smoking room; the tiles in the latter are green and white. Each block is about two inches square and, I am told, about one inch in thickness.

Whatever objections there may be against the use of such tiling they cannot be very serious, since the N.D.L. have decided to extend the use of it on all, or most, of their passenger ships. The joints of the small blocks are visible here and there, but such "cracking" is not apparent to any serious extent. There is one objection which I cannot refrain from recording, though it must be apparent to most passengers on first entering a rubber-tiled room. I refer to the unpleasant smell of something akin to sulphur which pervades every closed room the floors of which are tiled; it is for all the world like the smell of wet matches. At first I thought this might be due to the tiling having been recently laid; but the present lot is three and a half years old, and must have been washed at least one, and in some parts quite four, thousand times. It is as bad to-day as it was when I first boarded the ship, and is quite perceptible even in the hall, where a draught of fresh air can always be relied upon. I was told that, owing to the objectionable smell, the authorities would not like to use it in the passengers' cabins.

The steps and doors are provided with ordinary rubber mats of fair quality, deeply and parallel grooved, and about one-eighth to one-quarter inch in thickness. I am informed that the step treads have been renewed recently owing to their having been badly worn; the tiling alongside appears to be as good as when new. The authorities intend to replace all such step treads with ordinary rubber tiling on account of the ease with which the latter can be cleaned, the safer footing given to passengers, and the improved durability ensured thereby.

Wherever tiling has been used the effect is very pleas-

ing, especially when contrasted with the dull linoleum or ordinary flooring in other parts of the ship. I gather that the item of expense is a serious one, and it is mainly on account of this that the more extensive use of rubber tiling cannot at present be entertained on our largest passenger steamers. As far as I can ascertain from officials on board the N.D.L. steamers on which rubber tiling is now largely used are as follows:—Kaiser Wilhelm II., Kaiser Wilhelm der Grosse, Kronprinz Wilhelm, Kronprinzess Cecilie, Prinz Eitel Friedrich, Prinz Friedrich Wilhelm, and Prinz Ludwig. There are probably other steamers on the same line where tiling is in use, but definite information regarding them is not, at the moment, available; the foregoing royal group is, however, quite important enough to arrest attention. There is certainly a very big business to be done in this direction as some of our British rubber manufacturers already realise. At the moment it is in the nature of a luxury, though its usefulness, not only in ships, but in our own offices, schools, hospitals, hotels, etc., has been amply proved. I must, however, leave this interesting subject and proceed to deal with other points of importance which are daily cropping up.

Rambong in Sicily?

We have just said good-bye to Italy and have passed through the beautiful Straits of Messina; this is always the most enjoyable part of the journey. The scenery is of the best, the rocky mountains on the Italian coast, the terraced and green slopes of Sicily, and the narrow stretch of blue sea combining to form a perfect picture. The system of terracing adopted in the south of France, Italy and Sicily is most useful for hilly districts, and is, I believe, in vogue in parts of Java and Sumatra; but to what extent such lands are used by rubber planters I have no knowledge. No traveller need feel surprised at being unable to distinguish Rambong rubber trees along the terraced hills of Sicily, even though recent reports from that part of the world indicated the flourishing existence of a few well-cared-for saplings of the real *Ficus elastica*. I remember giving an account, many months ago, of the yield of rubber from some hot-house plants of *F. elastica* grown in Sicily, and throwing cold water

on the idea, then current, that in such a northern latitude that species might prove profitable under cultivation; growth is possible, but economic cultivation an absurdity as far as Rambong in Sicily is concerned.

Where Para Trees Will Not Grow.

There is a general impression, especially among persons who have not lived in the tropics, that all Para rubber trees require is occasional tropical heat. It is certainly little less than wonderful to see how many trees thrive in the tropics where the soil is of the poorest, but where there is a high temperature and plenty of water. Heat alone is not, however, sufficient to ensure continuous growth. A high temperature of 75 degs. to 85 degs. F. (average) is favourable to the cultivation of *Hevea brasiliensis*; but this alone would be of no value to rubber planters, even though they possessed the richest alluvial or volcanic soils in the world. There are many areas where Para rubber trees will not grow, though a temperature of 100 degs. F., and over, may often be registered. Relative uniformity in temperature, absence of frost and drought, and minimum seasonal changes are almost absolutely necessary for the successful cultivation of Para rubber trees in non-irrigable, tropical lands.

The difficulty with which vegetation grows, in spite of the advantages of high atmospheric temperatures, in the coastal regions of the area through which we are now passing is obvious to everyone; to east and west are extensive tracts of sandy deserts and salt-crusted pools; hardly a speck of green is to be seen for miles, except in the immediate vicinity of water. The natural vegetation, visible to the traveller on board as the steamer passes from Suez into the Red Sea, is miserably poor; here and there are tufts of stunted, coarse grass and general herbage, suggestive of more than three acres being required to feed one cow. Further inland, where conditions for plant growth appear to be more favourable, one might imagine it possible to come across laticiferous shrubs similar in habit to the Mexican guayule; but even they are absent from the immense tracts of flat, open country before us.

Approaching the Rubber Zone.

To those armchair rubber experts whose knowledge is confined to synopses of what others have done in the tropics, and who have actually wished their friends to believe in the successful cultivation of tropical species in sub-temperate zones, I would commend the course through which the writer is now passing. We arrived at Aden after having spent a few perspiring nights in the Red Sea. The change in climate has been very instructive. If you want to make a city rubber expert realise the differences between the hot damp air in the tropics and that in middle Europe, and thereby impress him with a knowledge of the climatic conditions under which Para rubber trees can be, and are really successfully grown, send him to a sun-burnt, barren land. He will feel convinced that he is approaching the rubber zone even though he may designate his imaginary destination otherwise. He will be assuredly impressed with the fact that there is a marked difference between the climate in Sicily and that in the true rubber zone. He will thenceforth pay more attention to questions of rainfall, temperature and humidity—factors he previously ignored in his otherwise satisfactory prospectuses. I have very distinct recollections of one illuminating prospectus in which the profitable cultivation of *Hevea brasiliensis* was forecasted in an area over 25 degrees from the equator, where the rainfall was about 30 inches and the air “keen, dry, with occasional frosts.” Even to-day there is deplorable laxity displayed in many documents appertaining to the cultivation of rubber-yielding species in African and American territories; many rubber investors do not appear to know that for each species there is a limited range of climatic factors under which each plant can be grown. Even in the small but productive island of Ceylon there are very many districts where it would be impossible to profitably cultivate any of the rubber plants now known to the scientific and commercial worlds; yet Para, Ceara, Castilloa, Rambong, Funtumia, Hancornia and other rubber trees are known, and vines of *Landolphia*, *Clitandra*, *Forsteronia*, *Cryptostegia*, *Urceola*, *Parameria* and others capable of yielding, in their own and similar districts, paying quantities of rubber, abound

in the tropics. The Para rubber plant, known for its hardy characteristics and power of adaptation, can only be grown over a small area in Ceylon. There are already indications that many parties, in other countries, have over-estimated the possibilities with *Hevea brasiliensis*, some few having been bold enough to advise that their planted properties shall be partly abandoned, even though the estates are in the middle of the rubber zone and are occupied with Para trees several years old. It is hoped that the mistakes of the past will not be repeated; they would be impossible if investors would exercise due caution before supplying capital for propositions similar to those referred to.

As the days roll on the heat and humidity are growing more and more unpleasant. Everything is getting sticky and tacky. The temperature in my cabin registered only 90 degs. F. at 2 p.m. to-day, but everything was quite damp and the air difficult to breathe. I have heard it said that rubber from the East tends to become tacky on account of the youthfulness of the trees whence it is at present derived; but surely there is latitude for further explanations on the change in consistency. No wonder the rubber becomes soft and "resolves itself into a dew"; the marvel is that it does not escape from the flimsy, unlined packing cases in the hold. One versatile visitor, an explorer from Brazil, who has his bicycle on board, gravely assures me that all his tyre punctures have been reopened by the melting of the solution—derived, according to his version, from Eastern plantation rubber. Oliver Wendell Holmes must have had such a being in view when he observed that there are men that it weakens one to talk with an hour more than a day's fasting would do. Be the facts what they may, it is quite obvious that we are nearing the hot, clammy rubber zone, of which we have so often vainly dreamed. It is a very satisfying climate.

Arrival in Colombo.

After a pleasant time we have arrived at Colombo. We left Genoa at about 5 p.m. on Wednesday, March 25th, were delayed about nine hours at Naples, four at Port Said, $1\frac{1}{4}$ in the Canal and at Suez, four at Aden—

total, 18 $\frac{3}{4}$ hours—and arrived in Colombo harbour at 7 a.m. on Friday, 10th April; a very satisfactory performance, especially as we were going direct east for a great part of the journey.

Ceylon and Rubber Developments.

About the time I first sailed to Ceylon—1900—few people in the East seriously thought of rubber growing; many of those who planted rubber trees did so for no special reason, except that there might be something in the cultivation apart from the general usefulness of Para trees as shade for cacao and for checking wash along ravines and steep land generally. I have a vivid recollection of one planter refusing an offer of several thousand seeds in 1900; he considered them useless at the time, and they were consequently thrown into the river. That same friend acquired wisdom with age, and, like many of his fellow planters who have since made their little fortunes, may congratulate himself that nothing more serious befell him. At the same time I do think that the average planter fully deserves the best of luck; the planter's life is healthy, and to some extent free. But it is no easy task to bring a rubber estate in the low country of Ceylon to a successful issue; in the course of years every planter runs his fair share of risks with diseases, and has many difficulties to overcome.

Planters' and Rubber Growers' Association.

I was surprised to find, on my arrival in Colombo, that a little feeling has apparently been created among some members of the planting community in consequence of the attitude which the "Rubber Growers' Association" has taken up on certain questions. The opinion was very forcibly expressed that the "Rubber Growers' Association" was interfering too much with questions which might well be left to planters on the spot; that they were, as a body, desirous of effecting economy in salaries in the tropics; and that the general freedom and privileges of rubber planters were being seriously threatened. A section of the Press appeared to think that the "R.G.A." had sacrificed its dignity by having a public squabble. A small number of planters still appear to believe that rubber cultivation is more of a



Rambong on Glen Bervie, Sumatra.

Klondyke deal than one requiring the utmost economy in management; they lose sight of the fact that rubber is as likely to fall in price as it is to rise, that labour will in all probability become dearer year by year, and that so far the difficulties which must arise, when immense fields of young rubber trees with only secondary and subsequent bark are being tapped, are unknown. They should realise that no effort is being, or has been, made to in any way interfere with their legitimate privileges, but only a desire to make rubber cultivation a success in the event of the raw product sinking in value to the price predicted by some experienced commercial men. The majority of planters, however, fully recognise the difficulties of the situation, and the present storm should soon be over.

Rubber Acreage in Ceylon and the East.

In the year 1900 I rarely heard of rubber cultivation in Ceylon; most planters to whom I showed microscopic slides depicting the origin and structure of the laticifers of *Hevea* regarded them, as did the writer, more from an academical than a practical standpoint. At that time Ceylon had very few acres of rubber trees—nearly, but not all, Para; the whole Eastern industry was then represented by only about 20,000 acres mostly occupied with young and scattered trees and owned by English and Dutch planters. Now the island of Ceylon alone can claim about 155,000 acres, Malaya nearly the same, and Sumatra, Java, Borneo, and South India quite sufficient to bring the total to 350,000 acres. That is a magnificent record, indicative of energy and application of which every individual—and especially if he be a Britisher—may feel proud and satisfied. It is admitted on all sides that the Eastern rubber-planting industry is at the present time largely controlled by men of British nationality, who have had a long and varied experience of tropical agriculture in Ceylon, Straits Settlements, and Federated Malay States. The Dutch possessions, more notably Sumatra and Java, have quickly adopted a cultivation which has given every indication of being effectively and profitably managed; in age of trees and actual planted acreage they are, however, behind British areas.

Facilities for Acquiring Land.

Less than a couple of years ago the Survey and Forest Departments of the Ceylon Government had their hands fairly full in attempting to deal with the applications for rubber land in the southern half of the island. Planters rushed in for land in the Kalutara, Galle, Sabaragamuwa, Kurunegalla, Matale and Uva districts; sometimes, I am afraid, without having seriously or accurately determined the suitability of the soil or the labour supply available in, or procurable for, each locality. Considering the way the business was put through, I think the Ceylon planters have every cause to congratulate themselves on the small percentage of hopeless failures which have, up to the present, been chronicled. So far the rubber trees are growing well, excepting those planted in exceptionally rocky, cabooky, or swampy ground; of the few estates which have encountered difficulties only one or two have their trees planted on bad soil, the majority having been landed in localities where the retention of an ample labour force is well-nigh impossible.

To-day comparatively few applications for new rubber land are received by Government—about one per cent. of those in 1906—the acreage already planted being considered quite large enough by most planters. There is, however, land still to be had. It is not long ago since certain Colonial Administrators in the East definitely announced their objection against capitalists in the habit of paying flying visits to the tropics for the purpose of acquiring land for rubber and effecting company promotion at the earliest opportunity. In fact, one or two officials refused to be hustled by such men at the time the rush for land was at its zenith. Personally, I would go one further and advise my readers to be very chary of companies floated and directed by capitalists who have no knowledge of, or permanent interest in, tropical agriculture; there are a few such groups who have gone into rubber because they think they see in it another means of “growing rich beyond the dreams of avarice.”

The Ceylon Government must, however, encourage the influx of capital which will lead to an increase of planted estates and subsequent produce, and give every

facility to natives and Europeans who wish to plant land and settle down in the Colony. So long as outside capital is forthcoming there is perhaps not the same necessity to offer financial assistance direct to the native or European planters, especially as far as rubber is concerned; the institution of agricultural banks and the methods of the officials in Malaya should not, however, be lost sight of, simply because agriculture has been in a plethoric state. The Government is not likely, however, to be troubled very much by too many land applications; Colombo, at the time of my visit, was badly in want of money.

As far as Ceylon is concerned, the feeling is general that further planting should be continued, only on a moderate scale; assuming that the present statistics for the Colony are correct, I anticipate that the premier Crown Colony will, before very many years are over, be in possession of nearly 200,000 acres of land planted with rubber trees.

I was much amused at the view taken by one high botanical official and advisor to the Home Government; he regarded the business as horrible since it meant the sacrifice of indigenous and endemic tropical plants to the felling axe of the rubber planter. It will be remembered that when the question was raised in the House of Commons early during the present year, in reference to Malaya, the responsible Minister explained that, as the rubber-planting industry had been the means of getting much-needed capital into the tropical country referred to, no restriction on the forests in the area affected would be advised.

A Tour in the Kalutara District.

The Kalutara district is among one of the most interesting in the whole of Ceylon to the rubber world.

We made a tour through the principal estates, and had a good opportunity of seeing what growth had been made during recent times; we were also able to observe the changes in methods adopted by the up-to-date planters of that district.

In a Humber Car.

Time was limited; it was, therefore, necessary to hire

the best motor car which Messrs. Walker, Sons and Co., of Colombo, could supply. This we did, and commenced our journey at 6.30 a.m. from the Grand Oriental Hotel, Colombo. Everything went along merrily until 7.30 a.m., when one of the back tyres exploded, and delayed us for quite an hour. The tyre once repaired, we recommenced our journey; but at 9.15 the second back tyre burst. We were not making our own pace by any means, for we had noted the information posted along the route to the effect that "eight miles per hour" was the limit for motors within Kalutara town limits. It is impossible to hustle in Ceylon.

Nor were the punctures our only source of delay. In the afternoon, when driving along a country road where stray cattle were abundant, we had the misfortune to be charged by a cow. The car fortunately won the day; the poor beast was landed under the wheels, and only after considerable delay was it extricated. I have in past times had the misfortune to run over dogs, a goat, a pig, and a large number of the feathered tribe, but never before have I been stopped by an animal the size of that cow. We met more or less domesticated buffaloes and elephants along the road, but they did not impede our progress. The car did well, and only the badly-kept roads and heavy rain could be blamed for the misfortunes which befell us later on. We did our level best to reach our destination, but owing to the heavy rains, the unmetalled roads deep in mud, and the dilapidated bridges, we had to turn back when within some four miles of the plantation we had set our hearts on seeing. On our return, as we were passing over the Kalutara Bridge, the car sank in the soft mud; the back wheels were buried midway to the axle. A large native force, which always collects in any low country district to see the fun, was soon at our command; by means of old railway sleepers and iron flanges the car was raised and pulled out of the mire. This was the most serious situation in which we were placed throughout the tour. When the motor car sank in the mud it blocked the railway line, and messengers had to be sent to the station-masters on either side to stop all trains until we were out of the way.

In the Kalutara District.

Along the Neboda road one cannot help being interested in the rocky hillsides and low-lying hills, over which young rubber saplings are abundantly planted. Here and there we found one or two rubber estates interplanted with tea, and a few of them mixed with coconuts. For many miles the rubber trees on either side of the road are young, being only one to two years old, but they are planted over very extensive areas. About four miles from Neboda there are some older patches, together with rubber and tea interplanted with *Albizias*. On most estates we were agreeably surprised to find a large number of fairly good sized trees which had not been even marked for tapping. We saw several paddy fields which a couple of years ago had been drained and planted up with Para rubber; the trees were doing well, as also were those in a few deeply-drained swamps. One or two estates appeared to have suffered from want of labour, the weeds telling the tale against many of the hardworking planters in the district. The majority of the estates appeared to be closely planted, 10 ft. by 10 ft., 12 ft. by 12 ft., and 15 ft. by 15 ft. being the distance commonly adopted. A few were planted 20 ft. by 10 ft. and 20 ft. by 20 ft.

The system of tapping varied; the basal Y and spiral system, the half-herring-bone, full herring-bone, V, and full spiral systems were all seen in Kalutara. Many planters in that district are of an inventive frame of mind, and very confident of the methods which they have adopted in the past; they continue very much on their own lines, and generally with satisfactory results. A case of one planter who has thrown over his own patents and adopted his neighbour's methods will be dealt with later.

Independence among Planters.

One of the striking features in the Kalutara district is the tenacity with which several members stick to their own ideas or the original methods they adopted. I will not mention names; the following tabulation will afford instruction on the point to which I refer :—

	Estate Cl.	Estate Gk.	Estate Dv.
Method of tapping. Knife used. Coagulating methods. Curing after coagulating. Form of rubber.	Half herring-bone. Miller's. Acetic acid in pails. Vacuum dryers. Crepe.	Full herring-bone. Michie-Golledge. Michie-Golledge machine. Chambers maintained at 85° F. Worms.	Spiral. Bowman and Northway. Acetic acid. Ordinary tea withering house. Sheet.

It is clear from the above that the systems adopted on these three estates are as different as they can possibly be. It seems almost impossible that each estate can produce rubber which can hardly be equalled by that of its neighbour. Nevertheless at most exhibitions the produce from these three estates are generally awarded some distinction. It strikes one very forcibly that results in the future will depend largely on the men in charge and not on the particular method or apparatus employed. Some of the planters, with the simplest appliances and by means of what undoubtedly are the crudest methods, achieve most magnificent results. Practical planters do not appear to require elaborate apparatus to turn out fine brands of rubber in large quantities.

Tapping.

Most of the estates are tapping trees which had a circumference of twenty inches a yard from the ground. A few were extracting latex from trees having only a girth of fifteen to eighteen inches. On the majority of estates the tapped trees on which operations were commenced a year or more ago were still yielding paying quantities of rubber; on one property, however, the tapping of young trees nearly five years old has been suspended, and will not be recommenced for quite another year as the proprietors are strongly of the opinion that whatever is lost in yield from the young trees is counter-balanced by the more rapid growth and subsequently larger yields.

The half-herring-bone system of tapping appeared to be the most popular one. Results published some time ago showed that although that system gave the minimum yield in a short period of time, yet it was one which ultimately gave a large yield per tree without entailing undue waste of bark. Such a system is not as drastic as the full-spiral or even the full-herring-bone.

Most of the estates are tapping from the base to about five or six feet. A few, however, are going as high as ten and fifteen feet. On very few estates was tapping limited to the basal parts of the trees; only on one property in the district were tapping operations limited to the basal parts of very old trees; there the trees were not being tapped above two feet from the ground, the basal Y or single spiral line system being adopted.

Raw Rubber Prices and Planters.

The main topic among the planting community in Ceylon was the price recently paid for the raw product. Planters know how dependent the issue of their ventures rests on the price to be paid for rubber, and now realise that their worldly possessions—many of them have invested their last rupee in some plantation or other—are subject to considerable fluctuations in value. Why Ceylon planters are surprised at the change in rubber prices I cannot understand, for they, more than most people, have known what it is to sometimes run their tea and cacao estates at a loss during periods of low prices. I distinctly remember a meeting being held at the Ferguson Hall, Kandy, in or about 1902, when tea planters were seriously discussing the idea of abandoning a fraction of each estate, when a dead loss was shown on a large number of estates, and private tea planters were in a very despondent state. Last year the prices were near the maximum, and the whole position was changed; this year tea prices are unsteady and almost wobbling, and the outlook is a little uncertain. Again, one might refer to the fluctuation in value of copra and cacao during the last three years to convince thoughtless people that rubber has so far only shown its affinity to other tropical products.

High Prices and the Result.

The pity is that the high prices of 1905 and 1906 appear to have been taken as the standard by many planters in assessing the value of their interests in companies and their own plantations. In several offices and bungalows, however, the chart of the "India-Rubber Journal" is nailed to the wall; a study of the information thereon depicted will perhaps help to dispel illusions. Not only have high prices led many to conceive fictitious values for their properties, but they have caused some to imagine that the industry is likely to be one of the most profitable ever known in the tropics, and as one which can therefore stand generous salaries and coolie wages. There is no doubt about the estates being valuable in the opinions of the majority of rubber planters; their convictions on that point are firm. The faith in the rubber industry which is held by planters whom I have so far met has been very inspiring, but I would rather that their basis of calculations be 2s. 6d. per lb. for plantation rubber than any of the prices realised during previous years. It might lead to the necessity for caution and economy being more deeply impressed on their minds.

Effect of 1d. in Price.

The majority of rubber companies now in existence are not affected by a small fluctuation in the price of rubber, because they are not in bearing. How far the raw plantation product will vary in value from day to day, when once it has gained prominence, in virtue of its quantity and constancy in composition, cannot be foretold, but it is quite likely that the price for rubber will change from time to time as does that of most other tropical products. What, then, will be the effect of a difference of one penny per lb. on the annual available dividends of properties in bearing? What such a fluctuation would mean can readily be calculated.

Let it be granted that the estate is 1,000 acres in extent; that the capital cost, when the property is in bearing, is £30 per acre; that the rubber costs 1s. per lb.; and that the price of raw rubber is 2s. 6d per lb. There is nothing unreasonable in any of the four conditions thus enumerated.

Such a property should at least yield, if properly planted, 150 lb. per acre per annum. The annual profit on a capital of £30,000 would be £11,250, or $37\frac{1}{2}$ per cent. Every penny per lb. for rubber above or below 2s. 6d. means an increase or decrease of about 2 per cent. on the available dividends.

If, as is quite probable, the estate yields 300 lb. of rubber per acre per annum, every penny difference in price means about 4 per cent. difference in profits.

If an estate costs only £20 to bring it into bearing and the above conditions prevail, the annual profit should be at the rate of $56\frac{1}{4}$ per cent.; every penny difference, with a yield of 150 lb. per acre, means $3\frac{1}{8}$ per cent. to the dividends.

Should the cost be £50 and the yield 150 lb. per acre, the profit available should be equal to $22\frac{1}{2}$ per cent. annually; a difference of one penny in rubber prices for the year would for such a company mean $1\frac{1}{4}$ per cent. on the dividends.

The following tabulated statement will perhaps help to make this clearer :—

Cost per acre.	Profit, if yield 150 lb. per acre.	Increase in profits for every penny increase above 2/6 per lb. Yield per acre.	
		150 lb.	300 lb.
£20	$56\frac{1}{4}$ %	$3\frac{1}{8}$ %	$6\frac{1}{4}$ %
£30	$37\frac{1}{2}$ "	2 "	4 "
£50	$22\frac{1}{2}$ "	$1\frac{1}{4}$ "	$2\frac{1}{2}$ "

It is obvious that the cheap estates will be more sensitive than the dear ones to any change in the price of raw rubber. The above calculations show, however, that if labour is properly managed and diseases are kept in check, rubber cultivation as a permanent investment should be sound.

The Oldest Rubber Trees in Ceylon.

A visit was made to the Henaratgoda Gardens to see the trees raised from seeds in 1876 and to study the effect of the various tapping experiments which the writer conducted prior to the Ceylon Rubber Exhibition. The trees have not been systematically tapped since the period mentioned, and an excellent opportunity was afforded to judge the quality of the work done by Singhalese coolies with the minimum supervision. The work of any rubber planter can easily be valued after an interval of two years; wherever the cambium or wood has been damaged, ugly irregular knots and gaping wounds are presented; if the best work has been done, the renewed bark will, after many years, present a relatively even surface.

Effect of Tapping Old Trees.

It is to the credit of the Sinhalese coolies that only about 2 per cent. of the trees which were tapped during 1905 and 1906 show faulty work. Two of the trees which are now knotty and partially decayed were originally bad specimens, the bark being uneven in thickness and warty; they were tapped every day for nearly a year, and during rainy weather their roots were occasionally under water for a week at a time.

The rest of the trees, tapped every alternate day, twice per week, once per month, etc., have healed wonderfully well. Even the specimens which by high tapping gave 14 lb. and 15 lb. of rubber each appear to be in excellent health, and would probably double or treble their past yields at a little sacrifice. They were all old trees (about ten to fifteen years) when tapped, and their healing capacity cannot be compared with that of young trees on estates.

The renewed bark is, in the majority of cases, nearly equal in thickness to that of the primary, untapped bark; the outer, dark, thin bark on the renewed tissue is peeling off and exposing a lighter-coloured, healthy, corky layer. I tapped several specimens and obtained an abundant flow of latex of fair consistency. The primary bark on trees 68, 56, 29, and 18 inches girth was $\frac{5}{8}$, $\frac{1}{2}$, $\frac{3}{8}$ and $\frac{1}{4}$ inch respectively in thickness; the renewed bark was generally about $\frac{1}{8}$ of an inch thinner, the interval of

rest being about two years. A large number of the trees on which these measurements were made were closely planted; the results may therefore be considered satisfactory.

Effect of Pricking on Old Trees.

I was led to expect, from correspondence which appeared in the Colombo Press some time ago, that the effect of pricking might be bad! There is always the danger that the teeth of the pricker might penetrate to the cambium and thereby do considerable harm. The trees at Henaratgoda were pared and pricked alternately, and the results may therefore be taken as a guide to planters. The impressions of the teeth of the pricker are very distinct on the outer, dark peeling bark; but on the inner, healthy tissue there is only a feebly rippled surface which will, in all probability, become even in course of time. The result was very gratifying, and strengthens the view so repeatedly propounded in my lectures to Ceylon planters.

I am still more inclined to recommend frequent incision instead of excision of bark for obtaining the latex now that a considerable improvement has been made in the Bowman-Northway pricking implement. The inventors named have brought out a new type of revolving pricker, the points of which are blunt and cannot, except when excessive force is used, cut into the wood. The sides of each tooth of the pricker are very sharp, and in the tapping operation they effect a slanting cut in the bark which does not penetrate to the cambium. The edges and not the end of each tooth do the required work; this new pricking implement marks another step in the right direction.

Can a Para Tree be Easily Killed?

It is over a couple of years ago since I had the top of a well-grown tree at Henaratgoda cut off, leaving nothing beyond a single stem, devoid of all lateral branches and leaves. That same trunk has now thrown out three branches near the top, two of which are about twenty feet in length and well supplied with foliage. The tree will, in all probability flourish exceedingly well; those

planters who have been repeatedly chopping off branches of their old trees might make a note of this.

In the same area there is a stump of an old tree now four years old; for three years it never produced a single leaf, but when I tapped it in 1906 a fair flow of latex was obtained and a medium-quality biscuit made therefrom. Now, alas, its days appear to be numbered. I tapped the stem and roots, but not a drop of latex came forth; the bark is almost dry, and soon the ants will be in that stump. I imagine that it has been a stump for nearly four years. On those estates where thinning-out is being done and the stumps not uprooted, a few years can therefore be reckoned on before decay sets in.

New experiments have been commenced on about sixteen trees; the stems have been rung at two levels, but so far no deaths have occurred, though the ringing was, according to my information, done in October, 1907. In fact, some of the trees were, at the time of my visit, throwing out suckers and making attempts to heal the cuts from above downwards. We shall look forward to the publication of the results from these experiments by the Director of the Peradeniya Gardens.

I carefully inspected the trial trees which were tapped by planters who, during my official work in Ceylon, received their first lessons at Henaratgoda. Those planters who are now in charge of some of the most important estates in Malaya can certainly re-visit their training ground and see the trees they tapped without offering any apologies. Every tree has healed, and no scars remain. If they do as well on the young trees with their much thinner barks there will be nothing to grumble at.

Manufacturers and Plantation Supplies.

I have re-visited parts of Ceylon which at the time I first saw them—nay, even last viewed them in 1906—were stretches of magnificent jungle; they are now a mass of red soil and rocky slopes plentifully variegated with long, slender whorled saplings of *Hevea brasiliensis*. Some day, if moderate expectations are realised, there will be shipped from these estates rubber at the rate of at least 50 tons per 1,000 acres now planted. The rubber from the 350,000 acres in the East will, on the low basis of one

pound per tree from widely-planted estates, be no less than 17,500 tons per annum; if, as is indicated by the results from estates possessing 8 to 10-year-old trees, the yield is going to be two to three pounds per tree, we have, in this new and very promising source, a supply of 35,000 to 52,500 tons per annum. Taking into consideration probable shortage of crops, due to insufficient labour, badly developed estates, and the ravages of diseases, it is reasonable ultimately to look to the East for at least 25,000 tons per annum. This is quite in addition to that from old sources in America and Africa, and will be much more constant in quality and quantity than that on which manufacturers have, in the past, been compelled to rely. It is beyond dispute that the period of bigger supplies and easier prices is, therefore, now in sight; such a change in the industry will be welcomed by manufacturers throughout the world. We may safely predict that from these estates there will be more rubber annually shipped than has yet been sent from the whole of Africa in any similar period of time; weight for weight, that from the Eastern Para estates will be almost double the value of that now sent from many parts of Africa. In this very small part of the tropical zone is to be seen the effect of centralization, and a planting policy conducted by Europeans with an up-to-date knowledge of tropical agriculture and business. No one can suppress his admiration for the work which has been done by a comparatively small band of Europeans and a large force of native labourers. If they had more capital at their command, the estates would reach maturity earlier, and the crops would be larger than they are likely to be; there is a scarcity of cash and temporary depression in the rubber growing centres of Ceylon at the time of writing.

Sight of Large Plantation.

I have been over several large, young, rubber plantations in Ceylon, and hardly know whether to be pleased or otherwise. The view from the summit of one of the hillocks is inspiring, but not satisfying. As far as the eye can reach, at the tops and beyond the hills, along flattish valleys and through drained swamps, the spindly stems and whorled leaves of rubber saplings of all sizes

and ages are visible; not another species can be seen, all original forest trees having been felled and burned. Such a property is hotter and more monotonous than an average tea estate, the latter usually being in possession of a few trees of *Grevillea*, *Albizzia*, *Acacia* and *Eucalyptus*, scattered among the low-lying, closely-planted green tea bushes.

Though the sight of an immense area planted with rubber trees only is impressive, and calls forth an expression of appreciation for the energy and foresight displayed, yet there is something one does not altogether like. The system is an unnatural one—that may or may not enable planters to get better results than if they strictly imitated nature—and strikes the visitor as being dangerous from the plant sanitation standpoint. I for one do not prefer these almost unlimited estates comprised of a single species, the plants of which will soon have, if they have not already got, their roots, stems and leaves in actual contact. Isolation is absolutely impossible on a mature rubber estate since other species cannot be interplanted on such a property and all forest belts have been destroyed.

It may be argued that large stretches of tea have retained their vitality for the last score or more years, and that a Para rubber tree is as hardy as a tea bush. Though it would have been very difficult to select a hardier tree than *Hevea brasiliensis*, planters must not lose sight of the fact that the treatment meted out to such trees is unique. The method of tapping adopted to-day is one which, if it does not kill, will weaken the trees and check the growth of every plant on the estate. During tapping one removes the hard primary bark and its corky layer, and exposes to the rain and sun a thin layer of soft inner, cortical tissues, capable of being easily pierced by insects and of supplying rich plant juices for germinating fungus spores. I do not want to take up a pessimistic attitude, but I have the feeling that the position is apt to be dangerous and likely to be aggravated by the systems of planting and tapping adopted on some properties. There is absolutely no protection against the spread of diseases similar to those affecting other tropical plants; the strictest vigilance on the part of planters will be

necessary as years roll on if parasites are to be kept in check. The time when action will be necessary is not as distant as many planters, who see the same rubber trees and nothing else every day of their lives, appear to imagine. It would teach them a little to see the same trees only after an interval of two years or so, during which time the trees had been continuously and systematically (?) tapped. My experiences lead me to believe that no government can too lavishly equip its agricultural department with officers competent to deal with diseases, willing to visit affected estates, and able to advise on any phenomenon indicative of the growth of obnoxious or dangerous pests.

It is fortunate that the destiny of the rubber-planting industry is largely in the hands of Europeans gifted with energy and persistent application. We can look to them to give prompt attention to any symptoms of diseases on their rubber trees.

Native Compounds and Isolation.

When travelling by motor through the Kalutara district an excellent opportunity was afforded of the distribution of the important rubber estates and their isolation or otherwise by means of native holdings. In travelling along the road between Clyde, Eagle's Land, Culloden, Vogan, Gikiyanakande, Devituri, St. George's and other estates, one sees a large number of compounds owned by natives, small patches of coconuts and other products, together with strips of jungle and chena. These areas, when they do not possess Para rubber trees, might conceivably be effective in checking the spread of diseases, and should, if possible, be retained as such. They should be quite as useful as many of the narrow strips of jungle retained as forest belts on some of the newly-developed properties in other parts of the East.

Each estate in Kalutara develops very much on lines of its own. A few hastily-made notes may be worth reproducing here, since they indicate the methods adopted on good properties.

Culloden: Field and Factory Work.

This important part of the Rosehaugh Company's properties possesses some very old trees, many of which

are being daily tapped. The half-herring-bone system is used, and each coolie is provided with Miller's knife and a pricker; the former is first used and some time after the teeth of the latter penetrate into the inner bark. Women and boys are largely employed for tapping. The collecting pails in the field are not enamelled, neither are they provided with lids. When filled with latex several Para rubber leaves are placed at the top, dip in the latex, and effectively prevent any spoiling during carriage to the factory. The latex is all collected from 6 a.m. to 2 p.m.

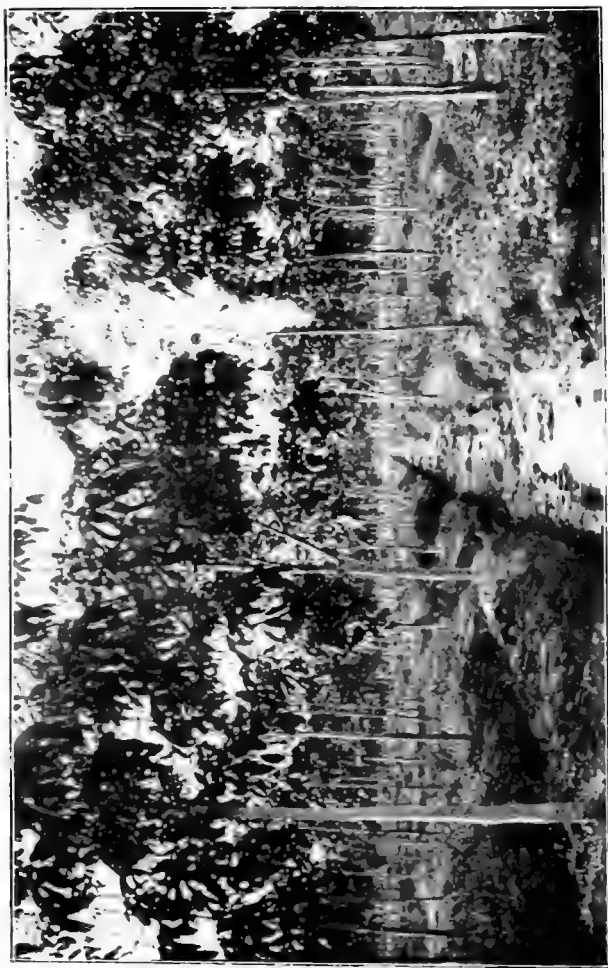
Coagulation is completed in ten minutes by means of acetic acid of fixed strength; the Michie-Gollodge coagulating machine in the factory is not used. The rubber is passed through washing rollers made by Jas. Robinson and Co., Salford, Manchester, and subsequently dried in Passburg's vacuum drier. Each pair of washing rollers deals with 1,065 lb. of wet rubber in ten hours, equivalent to 424 lb. of dry rubber; the vacuum drier, working half time only, disposes of 115,000 lb. of dry rubber annually. After the rubber leaves the vacuum drier it is hot and apt to be very soft and sticky; while in this state it is passed through the washing rollers, which are perfectly dry and cold, thereby being converted into excellent thick crêpe. The strips of rubber are then hung on inch wood laths, fixed near the ceiling.

Bark shavings are no longer collected on Culloden, owing to the coolies picking the scrap from the tapping lines much more thoroughly than in past days. The scrap is passed between a pair of Robinson's rollers, horizontally fluted, and converted into crêpe.

Three sets of washing rollers, supplied by 12 by 15 inch rollers, all horizontally-grooved, and a Passburg vacuum drier complete the essential machinery. An engine (Hornsby-Akroyd) of 36 h.p. is used to drive the apparatus.

Gikiyanakande.

This magnificent property, owned by Lord Elphinstone, is now in a very advanced state, and before long the number of trees fit to be tapped will be very large. Of the various methods employed on this property the notes given elsewhere will afford information. The full-herring-



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A fine stand of young rubber on a Kalutara estate.

bone system is adopted, the latex coagulated in a Michie-Golledge machine, and the spongy rubber cut up by machinery into worms. The worms are dried in twelve hours and converted into dry crêpe. Bark shavings are collected and rubber extracted therefrom.

The trees have been tapped from the base up to five or six feet in past years; now the renewed bark on this area, and the primary bark up to ten feet and higher, is being tapped, ladders being provided for the high tapping.

The machinery in the rubber factory consists of one pair of washing rollers supplied by the Federated Engineering Co., Kuala Lumpur; one Michie-Golledge coagulator, from Walker and Sons, Colombo; one machine for cutting the rubber into worms; one apparatus for pressing worms in packing; and the usual engine for power.

Vogan Estate.

The yield of rubber for the first quarter of 1908 from this property (4,294 lb.) compares favourably with that for the same period of the previous year; the estimate of over 22,000 lb. for this year is likely to be realised under the management of Mr. Tisdall. In a few years the export from this property will reach six figures easily. A very small factory is provided. The apparatus is of the simplest. Sheet rubber is made from the freshly-coagulated rubber by means of a piece of steel shafting and a small table covered with a zinc plate; the sheets are dried on sloping shelves covered with glass in air at ordinary temperatures. No scientific apparatus; no complicated tools; everything is of the simplest type. And the rubber is of good quality. Another fact indicative of the character of the manager of this property is that he has abandoned his own patent knife in preference to Miller's; he is also giving every encouragement to his engine driver, who is trying his hand at a new tapping knife. We could not suppress our admiration for the good quality of the work done by crude apparatus in the hands of an essentially practical man.

Another Estate.

A visit was also paid to another property in charge of a practical man gifted with inventive genius. He

asked us not to mention his name, and in deference to his modesty the hero of these notes must go unnamed.

The estate was generally clean weeded with the exception of one piece of steep land, which had been planted with rows of *Crotalaria* to check the wash; the manager was so pleased with the result that he intended extending the system.

Tapping at the base of old, but previously tapped trees, and young trees, was adopted. The pricker only was used to obtain the latex. The coolie task was 1 lb. of dry rubber from old trees and $\frac{1}{2}$ lb. from young trees per day; 22 ounces of well-rolled wet rubber were equal to 1 lb. of dry, each coolie's lot being numbered and subsequently checked when dry. The sheets are dried for one day at 100 degs. F. and then for seven days at 90 degs. F., in an ordinary tea withering shed. The yield from ten-year-old trees was 2 lb.; from seven-year-old plants 1 lb.; the tapping was very gently done, and only at the base of the tree.

The trees are tapped twenty days per month throughout the year. Drip tins were used in order to reduce the quantity of scrap; without these simple tin cans, the manager says he gets nearly 50 per cent. of scrap, but with them he hopes to get it down to 10 per cent. of the total rubber. The figures of the crops for 1907 showed 88 per cent. of clean sheet and 12 per cent. of crêpe scrap.

The tapping lines are marked on the tree in a very simple way, the only appliances being a walking-stick and a piece of string. The latter is tied to the stick to form a right-angled triangle, the stick is placed against the tree and the hypotenuse becomes the tapping line, sloping at an angle of 45 degs. Simplicity was again obvious in the coconut shells employed for collecting the latex at the base of each tree; and also in the name given to the latest knife invented by the manager.

We were shown some interesting photographs depicting the lateral spread of the root systems of Para trees which had been blown over. One tree grown in low land with its tap root in water, thirteen years old, had lateral roots 35 feet long; another of the same age had a lateral root system measuring 72 feet in diameter.

Cost of Rubber Production in Ceylon.

I visited several rubber properties in Ceylon possessing a large number of Para rubber trees of different ages, in bearing. On only one occasion was the superintendent unable to produce rubber at a profit when it stood at 3s. per lb. In this particular case all the tapped trees were from four-and-a-half to five years old; the youthfulness of the property and inexperience of the man in charge were probably responsible for such a condition of affairs.

The cost of production varies considerably on estates in the same district, and especially when the trees are of different ages. On one well-known Kalutara property the rubber during 1907 was delivered f.o.b. in Colombo at 80 cents (100 cents = 1s. 4d.). On that same property it was estimated that, in the future, when the whole of the estate was in bearing, the cost would be reduced to 55 cents.

On another property the cost when dealing with young trees only was 85 cents, and with old trees 48.15 cents per lb. of rubber. The superintendent hopes to be able, when the whole of his large estate is in bearing, to bring down the cost, f.o.b. London (but without London charges), to 50 or 60 cents per lb.

On another property the cost of production, including all charges in Colombo and London, was R1.50 from young trees. The manager was of the opinion that, as far as his plantation was concerned, the cost in the future would be R1.0 per lb. His coolie check-roll average was 35 cents per day. The same planter was of opinion that a very large labour force, at cheap rates, must be available to do the work at that cost over the whole island.

Standardization of Monthly Accounts.

It is very difficult to form a correct idea of the actual cost incurred in work such as marking the trees, tapping and collecting, curing, freight, packing-cases and packing, tapping-knives, etc., owing to the fact that each estate has its own form of rendering accounts. Furthermore, on plantations with tea and other products in addition to rubber, a varying proportion of capital and revenue expenses are charged against the rubber, according to the system of accounts adopted.

Then, again, tapping coolies are sometimes regarded as being very skilful, and, therefore, deserving of a higher rate of pay than the average coolie on the estate. A case in point was where tapping coolies were paid at the rate of 45 cents, though the coolie average over the property was only 35 cents. On another property, where the average rate of coolie pay was the same, the cost per day for tapping coolies was below the average, viz., 30 cents, on account of boys and women only being employed for such work.

It is absolutely impossible to compare the items of expenditure on different estates owing to the absence of agreement on any one system. The standardization of monthly accounts would be a boon; it is to be hoped that the suggestions recently made in London will be adopted as largely as possible. It would be to the advantage of the planting community and would certainly greatly assist directors and secretaries of companies in Europe.

Drying with and without Vacuum Driers.

While in Ceylon several instances were noted where planters, with very few appliances, were able to effect very rapid drying of the rubber and conversion of the same into crêpe without the use of any vacuum driers.

At one factory (Gikiyanakande) the freshly coagulated rubber was cut into worms, dried on trays in a small chamber well supplied with fresh air and maintained at a temperature of about 85 degs. F. In less than twelve hours the finely-cut, small pieces of worm rubber were dry. They were then passed through ordinary horizontally-fluted iron rollers, which were perfectly dry. The worms were by this means united to form one continuous, fine, even sheet of hot, dry crêpe.

A somewhat similar result has, I believe, been obtained in the Matale district by rapidly drying thin lace rubber and subsequently passing the material through rollers, to bind the rubber together.

On other estates the sheets of rubber are dried without any heating apparatus in ordinary rooms, but such a method involves a waiting period of weeks or months. On tea-cum-rubber plantations the sheets are placed in the withering sheds, maintained at 90 degs. F.;

the thin strips of rubber being thereby dried in one to two weeks.

On Culloden Estate, Mr. Macadam finds the Passburg vacuum drier very effective; the vacuum drier now in use can turn out double the quantity exported from the estate last year.

Yield of Rubber.

It is hardly necessary to state that the rubber-producing value of an estate cannot be determined and is not indicated by a statement of the yield of rubber obtained during any particular year. The yield obtained varies greatly according to the system of tapping adopted and the amount of bark which has been cut away. Several properties are known in Ceylon where the yield has only been from one to one-and-a-half pounds of rubber from trees over ten years old; but if the same trees had been tapped on a system similar to that adopted on other estates it would have been possible to increase the yield threefold. The principles adopted in tapping should therefore be taken into consideration when one is forming an idea of the rubber producing power of a particular tree or plantation.

Annual Increase in Output.

The yields obtained from some estates during the past few years, though small, show a gradual increase as the tapped trees get older and more young ones attain a tappable size and age. The gradual increase is exemplified in the yields obtained on Gikiyanakande, Neboda, Ceylon, according to the information kindly supplied by Mr. Golledge, at my request.

Gikiyanakande.

Year.	Yield per tree from young and old trees.
1903	0.59 lb.
1904	0.76 lb.
1905	1.32 lb.
1906	1.78 lb.
1907	1.86 lb.
1908 (1st January to 4th April),	8,175 lb.
from 11,694 trees.	

Coagulation in the Field.

On most Ceylon estates the latex is collected in the field and conveyed in pails by hand to a central factory, where it is coagulated. It is obvious, however, that a large amount of water is thus transmitted. In order to effect economy, several planters have suggested the coagulation of the latex in the field in small sheds arranged in central parts of each property. Mr. Golledge informed me that he proposed to have one coagulating machine on every hundred acres of land, the coolies to transmit the freshly coagulated rubber instead of the watery latex to a central factory, where it could be manufactured into its final form. This is only one of the many directions along which economy is likely to be effected. A trifling risk is, of course, run where ample supervision is not provided. If the freshly coagulated rubber is allowed to remain too long, it may become relatively unmanageable in the washing rollers. The rubber could, however, be softened by passing it through a pair of heated rollers, such as have been recently introduced in the tropics by a London firm.

Rate of Bark Renewal in Ceylon.

The rate at which the bark of tapped trees renews varies considerably. Generally the renewed bark forms most rapidly on trees grown alone and at a wide distance from each other; it renews very slowly on closely-planted trees, on those which have been planted in poor soil or associated with crowded intercrops. The bark does not renew quickly when the root growth of the trees is checked by the roots of other plants, and some surprising results may yet be recorded from estates with rubber planted among crowded mixed products.

On young trees the renewed bark is often swollen and convex in outline; within a few months it may attain the same thickness as the primary untapped bark. On older trees which have been deeply pared a longer interval is required for the renewed bark to grow to the same thickness as that of the untapped areas.

Measurements showed that on Gikiyanakande Estate the renewed bark when three years old on a nine-year-old

tree grown on poor soil was 4-16ths to 5-16ths of an inch in thickness.

The following measurements were also made on an estate in the South of Ceylon :—

Nature of Bark.	Age of Renewed Bark.	Thickness of Renewed Bark.	Height from ground of point of measurement.
Second Renewed Bark.	2 months	$\frac{3}{8}$ inch	Base
Second Renewed Bark.	15 "	$\frac{1}{2}$ "	$5\frac{1}{2}$ feet
First Renewed Bark.	36 "	$\frac{5}{8}$ "	5 feet

These measurements were made on a tree 14 years old, with a girth of 71 inches a yard from the ground. The remnants of primary bark above the tapping area had an average thickness of about 5-8ths in., so that the renewed bark, three years old, appeared to be equal to it. The tree gave 15 lb. of dry rubber during the last four years.

Another tree, $4\frac{1}{2}$ years old, had its renewed bark 3-16ths in. in thickness, though only two months old; this was nearly equal to the thickness of the primary bark above the tapping area.

The bark grows in thickness rapidly enough, but the latex therein does not acquire the degree of concentration desired for a much longer period.

Pricking and Paring in Ceylon.

I was agreeably surprised to observe the frequency with which trees were pricked on the occasion of my visit to several Kalutara estates. On two plantations, where a year ago only the paring operation was adopted, the pricking implement was used as soon as the flow following the paring operation had ceased. On another estate latex was never deliberately obtained by paring. Every evening the coolies went round to collect the scrap coagulated in the tapping lines and gently used the paring knife to remove only the outer dead bark and expose a new area below for the pricker. On the following morn-

ing the pricker was used on this fresh area, and the day's latex thereby obtained. By such a method great economy in bark is effected, and the risks accompanying the deep paring method are obviated to a large extent.

Labour in Ceylon.

Everybody knows, or believes, that coolies are generally abundant in the tropics, that their labour is very cheap, and that the native races do all the manual work in the open field. In most parts of the East these surmises are correct as far as they relate to those areas where rubber cultivation is at all popular. The rate of wages is by no means constant, though it is always fairly low. In Ceylon, where the rupee is equal to 1s. 4d., the small girls and boys get from 16 to 25 cents, women about 25 cents, and full-grown men 30 (rarely 45) cents, per day; the maximum average coolie pay ranges from about 5½d. to 7d., and the minimum less than 3d. During the last few years, and especially when rubber planters thought they were in for a bit of real luxury, almost bordering on extravagance, a few suggestions were made to the effect that the wage of the Tamil coolie would, sooner or later, have to be raised. So far, however, there has been no definite scheme agreed upon, and planters are living in hopes that a change will not be necessary on some estates. Tappers, when skilled men, are often paid at rates exceeding the average; on other plantations, where the same work is done by boys and women, the pay is sometimes below the average on the property.

No one with experience will deny that the Tamil coolie in Ceylon is, taken on the average, worthy of his hire and deserving of all the encouragement he gets. Contrast, for a moment, the hard-working Tamil coolie with the average type of Sinhalese villager, and I think the former will strongly appeal to you. The Sinhalese are, of course, in their own country, and there may not be the same necessity for persistent, strenuous labour on their part. The "simple life" appears to find favour with many of that race who have their own compound; there is something akin to philosophy in the habits of the average low-country villager. He does not care whether he toils or

spins so long as his coconut palms, planted probably by his ancestors, continue to produce nuts sufficient to satisfy his daily wants and to provide a surplus which he can exchange for other produce. He does not generally care to work for a daily wage, and dislikes being tied to regular hours and tasks; his wants on this earth are insignificant, and his pleasure and satisfaction in life is derived by squatting and sleeping while others work. Artificial heat and clothing are not much in demand; good plants abound on every side, grow very quickly, and furnish him with essentials.

Sinhalese and Rubber Estates.

There are not sufficient rubber, tea, cacao, coconut and other estates in Ceylon to provide daily work for every able-bodied Sinhalese villager; nevertheless, the importation of Indian coolies takes place almost daily, and must be continued if the agricultural industries in that island are to be properly maintained. It is not that the indigenous labour is inefficient; it is because so many villagers do not consider it necessary to do work on estates other than their own. The Sinhalese who take a turn at agriculture are good workers, especially with rice and such cultivations as their ancestors have engaged in from time immemorial. They are excellent at forest work, being very useful for felling trees in rubber clearing work, and also sometimes for the more skilled labour involved in tapping. At Heneratgoda, a couple of years ago, I carried out a series of experiments in which all the tapping was done by Sinhalese villagers with very little supervision; the skill with which they manipulated the tapping knives drew forth expressions of approbation from F.M.S. planters who saw the work done by them on the occasion of the Ceylon Rubber Exhibition. It is a pleasure, after having seen congregations of idle, lounging coolies at every village, and at every point where the motor car broke down, to come across a few who by sheer industry have turned out exquisite brass, silver, wood, and fibre work. The artistic faculty is strongly developed in many families, and some encouragement is given by local officials, who are prepared to buy all finished articles at a fixed rate.

However, I have seen sufficient of the labouring classes in Ceylon to lead me to believe that that island will not be the first to suffer when a shortage in supply occurs. Nevertheless, there are many reasons why the Sinhalese, in the south of the island especially, should be more largely employed in general tapping work. They might in that capacity prove very useful in years to come. I know of one property where they are employed and paid lower wages than Tamil coolies in more healthy districts. The circumstances under which the manager lives are, however, somewhat exceptional.

Impressions of Ceylon.

I left Ceylon after seeing only a few of the best rubber properties in the island. I had many opportunities of discussing every phase of the industry with Government officers, editors, planters, and business men, and my previous convictions are still unaltered.

I look upon Ceylon, in virtue of its climate, its trained European and very practical planters, and its abundant labour force, as being among one of the most favoured parts of the East for rubber cultivation. Para rubber cultivators have still a great deal to learn and forget, but even now the cultivation can be regarded as a proven agricultural success in Ceylon as in Malay.

London has not heard much about Ceylon rubber companies up to the present, partly because many of the estates with old trees are in private or local hands, but mainly on account of the trees not yet having attained a tappable size. In two to three years the position of affairs will be changed, for there will then be coming into bearing several thousands of acres of which the public in Europe know nothing. I am told that I shall be much more favourably impressed by the agricultural developments in Java and the labour and soil there available. My opinions on that favoured Dutch colony will be duly recorded, but in the meantime I claim the foregoing for Ceylon.

It would be an idle task to name all the planters and others who so generously gave up their time to me during my short stay in Ceylon. To them and well-wishers I

tender my thanks. To those I promised to visit but never saw, my humble apologies are now offered.

Bound for Penang.

I left Colombo on Easter Saturday, 18th April, at 8 p.m., by the P. and O. "Delta," bound for Penang. There were very few passengers, and I had a good rest. Rubber tiling could nowhere be found on the "Delta" as on the "Prinz Eitel Friedrich," though the floors of the smoking saloons on both decks were provided with red rubber mats about half an inch or more in thickness. Some of the stair treads consisted of wood with strips of rubber inlaid; altogether a poor show of rubber on board. That is why I had an easy time. We arrived at Penang at daybreak, April 23rd. The journey was unnecessarily prolonged.

In the Straits Settlements.

I had the pleasure immediately on arrival of meeting Mr. S. H. Menzies, who is planting rubber in Ipoh, Perak, the Hon. Mr. John Turner, of Caledonia Estate, Wellesley Province, and Messrs. Anthony and Anderson, the tea and rubber brokers; I also went to see the representatives of Messrs. Boustead and Co., Messrs. Huttenbach, Liebert and Co., and then made for the Botanic Gardens in charge of Mr. Walter Fox, the Superintendent of Forests and Gardens, Penang. Mr. Fox made the afternoon pleasant and instructive in the beautifully situated Botanic Garden on Penang Hill. The Garden is more or less horse-shoe shaped, is situated in a gently undulating valley, and surrounded by well-wooded hills; there are only some 60 acres altogether, but many plants are growing there which are of interest to the rubber world.

Rubber Plants in Penang.

There are no European plantations to speak of in Penang. At the time rubber cultivation was booming in the Malay States, the native agriculturists of Penang—mainly Chinese—had their lands occupied with coconuts, nutmegs, cloves, etc.; at the present time not more than about 2,000 Para trees are, according to Mr. Fox, flourishing in the island. In the early days, owing to the

labours of Curtis, some eighty trees were planted along Ayer Rajah Road as an experiment to determine their suitability as shade trees along road sides. The trees appear to be about 8 to 10 years old, and many vacancies occur. Last year the local government authorities allowed an enterprising native to tap the trees on payment of fifty dollars. Bad tapping was done, and I was glad to learn that the business had been stopped. Municipal enterprise is all very well in its way, but there is something in this transaction which seems canny.

In the Botanic Gardens there are very few Para trees, but one specimen, in full flower on the occasion of our visit, is of particular interest. The tree is probably about 20 years old, has bifurcated at a yard from the ground, and has a basal circumference of seven feet. It has been tapped regularly during the past few years, and according to Mr. Derry's Annual Report of 1907, has yielded a grand total of 37 lb. 13½ oz. of rubber. Judging from appearances, I imagine it can be made to yield double that quantity before being killed by tapping.

There were some miserable specimens of *Ficus elastica* (Gutta Rambong) and *Funtumia elastica* (Lagos silk rubber); one tree of the latter, 5 or 6 years old, had a height of ten feet and a basal circumference of only six inches. There were also some nursery plants of the Jequie or Manicoba rubber, the balance of the plants received from Kew having been planted in one of the forests in Wellesley.

Gutta-percha plants were being propagated in the nursery, a very large number of *Palaquium oblongifolium* seedlings being ready for transplanting. The real Gutta—*Palaquium Gutta*—though in its native home, is not growing very satisfactorily in the poor soil provided for it; one tree, planted in October, 1900, was only 8 feet high, and had a basal diameter of 1½ inches. When in Java I hope to find out the truth about the yields from the gutta-percha trees grown on the Government Plantations in that island.

The Straits Settlements.

It is dangerous to give details from observations made while travelling in a train, but Eastern ones are not equal

to an English express in speed, and as I had the good fortune to be conducted by two local planters, the points I gleaned shall be put on record. A long journey lay before us from Penang through Province Wellesley, Perak, and Selangor on to Kuala Lumpur. We left the first place at 6.45 a.m., and arrived at the latter at 6.40 p.m.; considering that a distance of nearly 250 miles was covered in that time, there was nothing to grumble at for tropical railway travelling.

Wellesley Province.

The country through which the train passed immediately it left Prai railway station was comparatively flat, only one range of hills on the left being visible to the traveller. A large number of sugar estates and tapioca lands were interplanted with Para rubber, a space of two or three feet only being allowed around the young rubber saplings for free root growth and light. The nature of the soil was indicated by the fact that estates planted with sugar have been interplanted with Para, and after the sugar crop has been harvested a crop of tapioca has been taken off the same land. Most of the small estates are owned by Chinese, and appear to be in a poor condition. In sharp contrast with these is the fine plantation, managed by the Hon. Mr. John Turner, known as Caledonia Estate. A large number of the trees are only about two years old, and show healthy growth; other parts appear to be about eight years or older, and planted at different distances. One block, planted 10 by 10 feet gave no less than 300 lb. of rubber per acre last year, and will, in all probability, yield at the same rate for some time to come; the trees on that section were, however, much smaller and thinner-skinned than those on the adjacent block, planted 20 by 20 feet.

Perak State.

This state, the capital of which is Taiping, is nearly the largest in Malay, and though known better in London for its sugar and tea, is one of the coming centres for rubber cultivation. It is estimated that about 34,000 acres are planted with Para rubber in this State alone, its fine stretches of level and well-planted land should yield paying quantities of rubber three years hence. Chinese and

Tamil labourers are abundant and available at fair rates. One or two estates are already tapping, and the small Government plantation has been, or is about to be, leased for rubber collecting purposes. An experiment has evidently been made, not far from Taiping, with *Ficus elastica* trees on an old tin-mining site, but the trees are only poorly developed.

From Tali Ayer Estates some samples of rubber, from trees which will be only four years old in August, will be sent to the Rubber Exhibition in London to draw attention to the rapidity with which the trees sometimes grow in Perak. This estate also possesses a large number of trees, rising two years in age, planted in deeply-drained land. The soil in the flat parts is good, but that in the more hilly district is not at all striking and would hardly compare with much of that planted with rubber in Ceylon. A large area of the flat country has been superficially worked by the Chinese for tin; such land often forms part of a rubber-cum-tin proposition, but should be regarded as of no value for rubber growing.

Several rubber estates were passed through after leaving Taiping. The first one of note was, according to my informants, owned by Dr. Jamieson, who is interested in Penang developments; the part visible from the train was only two years old, and was planted on what, for the district near Padang Rengas Station, might be termed hilly land. I assured my friends, however, that most remarkable growth was obtained on much steeper and stony slopes in Ceylon. Gapis Estates, with Mr. Salisbury in charge, was the next property of importance; many of the trees will soon be fit to tap. I understand that Mr. Mackay, of Ceylon, knows this plantation well.

Kaumuning Estate, well-known on account of its connection with Messrs. Guthrie and Co., London, is managed by Mr. Machado, late of the Singapore Botanic Department. On this property are considerably over one thousand acres planted with tappable and young trees, most of which appeared to be well branched and growing vigorously; the undulating land whereon many of the trees are planted should give good results. An interesting feature of this estate was the number of young trees of *Castilloa elastica* growing there. So far I have

not seen this species cultivated in Malaya. The Sungei Siput district in which the plantation is situated, and being extended, appeared to have a comparatively good soil.

Rubber in the Federated Malay States.

We soon passed the last station in Perak (Tandjong Malim), and found ourselves in Selangor. If there is one district more than another which has gained fame for its rubber trees, and has attracted the attention of rubber investors, it is surely Selangor; it certainly possesses some of the oldest and heaviest yielding Para estates known in the world at the present time. Space will not permit me to detail the numerous estates seen from the train, but there is one very large property near Sungei Buloh railway station which appeared to be of enormous length, the parts of which were separated by means of narrow strips of jungle trees. I was surprised to notice not in Selangor alone, but in other parts through which we passed during the day, that very large areas had been recently planted, and new areas were being felled and burned. It struck me that Malaya would not be long before she caught up to Ceylon in planted acreage; the new extensions created mixed feelings.

Kuala Lumpur to Klang.

At Kuala Lumpur I had many opportunities of conversing with the leading planters and bankers. It was a case of Colombo repeating itself. Everybody had over-speculated in rubber, and been landed with more script than they could hold. One or two young estates were on offer for less than actual costs, and up to the time of my leaving did not find buyers.

I heard of the 30-year-old trees planted at Kuala Kangsar by Sir Hugh Low, some of which measured a considerable time ago from 108 to 111 inches in girth. A few years ago the trees were tapped by Javanese coolies, but the results were then considered so trivial that the Governor of the day ordered them to be cut down. That same authority appears to have changed his views, judging from the active interest he now takes on many boards of directors at home.

From Kuala Lumpur to Klang is only about an hour's run, but it is one of the most interesting trips in Malaya to rubber growers. The fact that we passed through Pataling, Sungei Way, and Batu Tiga railway stations is indicative of the importance of this part of Selangor. The Pataling Estates is one of the first passed on the left, the old trees on which appeared to have been very neatly tapped; there were one or two patches of mimosa given up to green manuring. The evil effects of close planting were to be seen on many properties, the stems being bent at all angles, and thin and weak; many were being pollarded in order to give more light to the better developed trees.

The Klang District.

This is the centre of the planting area in Selangor, and I made many journeys to the leading estates therefrom. I had some very good times on Vallambrosa and Bukit Rajah Estates, and got sight of Beverlac, Sheldford, Sungei Kapar, Golconda, Kapar Para Rubber, North Hummock, Scottish Malay, and many other estates. I hope to return to the district after my visits to Java and Sumatra, and see other well known properties.

Vallambrosa.

Mr. H. M. Darby kindly conducted me over every part of this property. I had the pleasure of seeing the old tapped trees, the young extensive clearings which will soon be in bearing, and the estate known as Bukit Kraiong recently taken over and now being developed by that company. It is remarkable to see how well the bark has been dealt with; many of the trees which have been regularly tapped still possess from one-third to one-half of the original primary bark below five feet. There will be no necessity to think of tapping renewed bark on Vallambrosa for a long time to come, though some of it is already over three years old, and full of rich latex. The various sections have been planted at 10 by 10, 10 by 12, 17 by 17, 20 by 10, and 20 by 12 feet apart; all the latter day clearings are planted 24 by 12 owing to the large yields already obtained from a very big block planted at that distance. I was informed that



A 14-year old Hevea on a Ceylon estate apparently growing out of solid rock. The girth at 3 feet from the ground is 53 inches.

the trees on that block gave 3 to 4 lb. of rubber each; the more closely planted estates gave about 2 cwt. per acre during the same period.

The rate of growth on many clearings is phenomenally rapid, and would cause many Ceylon planters to ponder. I measured many trees, not yet three years old, which were 18 to 21 inches in circumference a yard from the ground; they will be 24 inches, long before they are four years old. Most of the young plants have been thumb-nail pruned at about ten feet from the ground, and now possess good heads of fresh healthy foliage.

There are now nearly 1,000 acres at the tapping stage; 250,000 lb. will probably be obtained during the current year. This should be very largely exceeded when the young clearings are in bearing.

Young Estates.

I then took a journey by motor along the road to Kuala Selangor. I saw a part of the Sungei Kapar Estate, planted 15 by 15 feet, which was being tapped. Only one-third to one-half of the first five feet from the base of each tree was being tapped on the half herring-bone system. A few trees were being pollarded at a height of 1 to 7 feet, the latter system being stumps which can be tapped for quite a year. Beverlac was the next property I saw where trees, apparently about ten years old, were being tapped on the half herring-bone system up to five or six feet from the base. After just catching only a glimpse of Golconda, we reached the property of the Kapar Para Rubber Co., known as Jalan Estate, and associated with Messrs. Fletcher, Oswald and Nevitt. I was informed that this property had over 2,000 acres planted. What I saw of it was in excellent condition. The directors appear to have made up their minds that the clearings, originally planted about 15 by 15 feet, were too closely planted; every alternate row has been felled, even though the trees, judging from their sizes, must have been in their third year. They were also thinning out the four-year-old clearings by felling the thin trees near the base.

The soil in this district is composed of a rich clayey loam with plenty of humus in the first foot and a stiffer

bluish clay below. It is so soft that you can, with the slightest exertion push your walking stick out of sight. The water level is often only 1 to 2 feet from the surface. It is the custom to drain the land prior to felling in order that the soil may have a chance to dry and sink before planting operations are commenced. There is hardly a stone to be seen on any estate; the land is mainly flat.

Weeds: A Lalang Killer?

The weeding bill on most young estates in Klang is a pretty big one. I have seen several blocks which have cost 2 dollars per acre per month, and will cost 18 dollars per acre for the next twelve months. Where Para trees grow rapidly the weeds do the same. I have seen that weed pest—lalang—so high as to bury the railway boundary posts nearly five feet high; the cost of uprooting the lalang is enormous. In view of the efforts being made all over the Peninsula to suppress this weed, I was particularly interested in a patch of lalang ground on which the wild "passion flower" plant had been placed. The latter had crept on the lalang, and only occasional tufts of the grass could be seen. I was informed that the wild "passion flower" plant has proved itself capable of keeping lalang in check, and is being largely used on several well-known clearings.

Bukit Rajah.

I shall never forget my visit to Bukit Rajah. The tapping is the best I have seen in so far that the cambium has only rarely been cut. I have, when visiting estates, usually challenged the superintendent to find me a tree, tapped for at least a year, which has not been injured. I have been over a large number of estates, but it was on Bukit Rajah that I saw the first perfectly tapped tree, free from even a trace of a wound. An ordinary tree has the knife along some part of it about 400 to 500 times per year, assuming there are ten tapping lines; no wonder the cambium is touched once or twice during these operations. An ordinary gouge is used for tapping—an implement surpassing all others for simplicity and cheapness, and yet one with which an unlimited amount of damage can be done. Yet it was on a pro-

perty where the gouge was used that I saw tapping second to none; which proves our oft-repeated contention that success depends on the man using the knife, and not on the implement itself. I kept my eyes open when going over the clearings and the sections planted with coconuts, Rambong rubber and coffee, and concluded that the rubber crop alone for the current year should not fall far short of 200,000 lb. It is obvious that this property will soon outrun many others in yield of rubber.

Tapping is usually done on the half-herring-bone system, only the leading trees being tapped on the full-herring-bone system. The bark below 5 feet has lasted four years, and the renewed tissue is often quite as thick as the original or primary bark. It is anticipated, however, that the trees will be tapped from 6 to 9 feet before the renewed bark on the basal section is touched. Each tree is tapped every alternate day for three months and then rested two months. The trees are not tapped until they girth 20 inches a yard from the ground.

Some parts of Bukit Rajah have been planted 20 by 20, 30 by 15, and 15 by 15 feet. I saw some trees planted in March, 1904, which were 20, 25, and even 29 inches in girth. Many of the five-year-old trees, planted 15 by 15 feet, had a girth of 26 inches. This property, in virtue of the widely-planted trees now two, three, four, five, six and ten years' old, must rise in value in a very short time. The view from the bungalow of the manager, Mr. C. T. Hammerton, is very impressive, between 2,000 to 3,000 acres of planted rubber trees belonging to Bukit Rajah alone being visible.

The factory is well equipped with up-to-date washing rollers, a Passburg vacuum drier, and an oil engine. Mr. Hammerton is curing rubber for several small estates in the district, a fact from which one may glean the capacity of the machinery already in the factory.

I shall go back to what I saw on Bukit Rajah and Vallambrosa at a later date.

Planters' Association of Malaya.

It will surprise many people at home to learn that the planters usually hold their important meetings at Kuala Lumpur on a Sunday. The usefulness of Planters' Asso-

ciations is recognised by all. From all I have heard in Malay, I would strongly urge that every effort be made to establish cordial relationships between the Planters' Association of Malaya and the Rubber Growers' Association; they certainly do not exist at the present time. At the time of my visit some strong language was used, especially by many of the younger planters, on the subject of the regulations issued by the R.G.A.; feeling ran high in many quarters, and suggested "indignation" meetings were referred to in clubs and by the Press. I understand that several members of the P.A.M. refused to recognise the R.G.A., and that others did not see the necessity of dealing with any parties outside the board of directors to whom they were responsible. On the other hand, many very excellent men and planters were of the opinion that the R.G.A. should first confer with the P.A.M. before issuing regulations affecting hours of work, private interests and salaries of planters. Many of the leading planters recognised the necessity for economy and efficiency in management, and realise that the R.G.A. do not wish to be unfair; but there are others in very responsible positions who refuse to reply to several points in the circular though they have received the latter direct from the secretary of the company by whom they are employed. Some members of the R.G.A. who were visiting estates in Malaya expressed their opposition to the new regulations very openly, and even went so far as to address letters to the Press on the subject. The P.A.M. were to discuss the R.G.A. regulations at a subsequent meeting; the unpleasantness and opposition in evidence among the planters can be prevented in the future if the two organisations can be brought into closer touch with each other. This should not be difficult to accomplish, since their interests are so intimately connected.

Klang to Singapore.

On Wednesday the 29th April I left Port Swettenham on board the ss. "Perak" for Singapore. We left at 5 p.m., and arrived at Singapore at 10 a.m. on the following day, the run being just over two hundred miles. Rubber tiling has now become a favourite theme, and

I naturally looked to find some laid down, but in vain. I was surprised to learn, however, that the new ships, owned by the Straits Steamship Company, are being supplied with rubber tiling in some of the saloons and corridors.

During the voyage we did not see much land, though just before sunset a part of Jugra Hill was visible.

Singapore and the Rubber Industry.

I do not know of any other tropical British port in the East where rubber manufacturing has gained a footing. It appears to have taken up a position, in Singapore, of interest if not of importance. The factory is run by Van Ryn; a large number of sound tyres for carriages and cycles, and valves for ordinary engineering work, are being turned out.

My object in visiting Singapore was to call on H. N. Ridley, F.R.S., the Director of the Botanic Gardens, and to see the Para rubber trees on which he and Derry have been conducting so many valuable experiments. The Para trees are of special interest, especially those planted by Murton in 1876 and Cantley in 1887; some of the latter are five, six, nine and twelve feet apart, have attained a large size, but now appear to have stopped growing. Another batch of trees gives one a very good idea of the hardy nature of *Hevea brasiliensis*; two trees have been blown over, and from each stem branches have assumed an erect position, have developed, and now form vertical stems which can be tapped; one tree has no less than nine vertical branches, the other eight, six of which have been tapped.

Everybody knows how well Para trees may thrive on soils too poor to support other plant life, but I saw one case at Singapore which indicates the limit. The tree was growing on a slope possessing a few scattered trees and a thin layer of turf, the soil was poor, and really was more inferior than it appeared to be. Mr. Ridley asked me to guess at the age of the tree—work which one thinks he gets quite smart at after visiting properties of all ages in Ceylon and Malaya. The tree had the appearance of an ordinary eight-year-old specimen in Selangor, and I fixed the age at that figure; it was twenty-

five years old, and was preserved by the Director to show what might happen to trees similarly planted on poor soil.

The Giant of the East.

I remember giving the sizes of the oldest trees in Ceylon in one of my publications, and placing the credit to that island for being in possession of what I regarded as the biggest Para tree in the East. This was refuted by Mr. Ridley, and I took the opportunity to remind him of the incident. I was forthwith conducted to one of the trees planted in 1876 and transplanted in its present position in 1880; this specimen had thrown off three branches at a height of four feet from the ground, and to this fact can be attributed the exceptionally large size of the basal region. The tree girthed, at a yard from the ground, no less than $122\frac{1}{2}$ inches, and must therefore stand as the record for the East, if not for the world. I have no records of a Para tree exceeding that size. The tree has been tapped on almost every system known, and has given considerably over 30 lb. of rubber.

Para Trees under Forest conditions.

One of the most interesting features in the Garden is the experimental block of Para trees in and under high forest. The Para rubber tree, on account of the rapidity with which the seeds lose their germinating capacity, has only a poor chance to spread in primitive forest. Long before the seed finds a bit of soil it may have lost its germinating power by exposure to unfavourable climatic conditions; even if it germinates it has to compete with the roots of the surrounding plants, and finally to combat many natural forest enemies before it can top the highest trees. To determine how young plants would survive in forest, Mr. Ridley planted *Castilloa elastica* and *Hevea brasiliensis* in a thick forest full of *Albizzia*, *Eugenia* *Cæsalpinia* and other trees rising to a height of forty or sixty feet. The shade was very dense, and all the *Castilloa* plants have disappeared. The *Hevea* trees have, however, survived, and some of them compare very favourably in point of size with the biggest forest trees surrounding them; the largest speci-

men measured 82 inches in circumference. The trees have shed their seeds and numerous seedlings are springing up in the forest. It will be extremely interesting to see how the Hevea trees spread through the forest in course of time. This little experiment should give the rubber world very reliable knowledge of special importance to those concerned with Para trees in tropical American forests.

Native and Introduced Vines.

Experiments have been made with the indigenous vine rubber—*Willughbeia firma*—and the introduced African vine—*Landolphia Hendelotii*. Mr. Ridley informed me that the African vine produced a stout stem, and then bushed in a satisfactory manner; of all the introduced vines he considered this the most promising. But compared with the indigenous vine it did not show up very well, the rubber from *Willughbeia*, when properly prepared, being better than that from *Landolphia*. I was surprised to learn this.

Packing Seeds for Long Distances.

The Singapore Botanic Garden authorities have persistently refused to recommend Wardian cases for transporting Para seeds on account of the expense incurred. Mr. Ridley has always got good results by packing in burnt rice husks. The old rice husks are obtained from the padi mills and burnt; the residue consists largely of finely-divided charcoal, very light in weight. Before the seeds are packed in it, the dust is sprinkled with water. One kerosine oil tin holds about 600 seeds; the tins are sealed in the ordinary way, and despatched. Mr. Ridley stated that after a journey occupying over four months 60 per cent. of the seeds germinated. Such a result is quite good enough, considering the slight expense to which the purchaser is put. I was told that over 20,000 Para seeds had just been sent for the plantations of the Liberian Rubber Corporation in West Africa, from Singapore.

The Dutch East Indies.

We have recently given the readers of *THE INDIA-RUBBER JOURNAL* an account of the official work done in

connection with gutta-percha and india-rubber industries in Java. Everybody in the business has heard of the abundant and cheap labour in Java, the magnificent soil in that island, and the rapid growth of Para rubber trees in favoured districts. It was, therefore, with a feeling akin to keenness that I sailed from Singapore at 10 a.m. on May 1st, in the s.s. "Both," owned by the Koninklijke Paketvaart Maatschappij (commonly known as the Royal Packet Steam Navigation Company). We arrived at Batavia at 3.30 p.m. on the 3rd May. The trip through the Malacca Straits was quite enjoyable, the innumerable scattered islands giving hourly variety to the pleasure-seeking traveller.

Java.

There is nothing of special interest in Batavia to the rubber grower. The Dutch manner of living and doing business impressed me very much, especially after nearly seven years in Ceylon and a hurried tour through some of the Federated Malay States and Straits Settlements. The costumes worn, customs adopted in the heat of the day, the beautifully-laid bungalow hotels, steam engines for trams, watering the streets by hand-carried garden cans, the time taken to get our luggage on shore and through the customs, and the musical clubs, prevent you from rushing through work. The natives are slow to move, and you begin to disbelieve the story that Java is, or ever was, a volcanic island. English colonists can certainly take a few lessons from the Dutch on how to live in the tropics.

My first journey was to the world-famous Botanic Gardens, Buitenzorg, under the directorship of that most distinguished scientist and administrator—Dr. Treub. The journey from Weltevreden Station to Buitenzorg took us over an hour, and was not particularly striking. The principal cultivations were rice, coconuts, tapioca, kapok, sugar and groundnuts. The selecting of seed parents in the mature paddy fields and the transplanted seedlings were, however, points which native agriculturists in other parts of the world might well take note of. By these means the Javanese appear to have developed a variety of rice of much superior value. Canals are met with

frequently in town and country, and the soil is of deep-chocolate colour. On some of the paddy fields were swarms of coolies, the number being such as would be required for ten times the same acreage under rubber.

Experiments at Buitenzorg.

I had the good fortune to meet Dr. Tromp de Haas, the caoutchouc specialist, and Mr. J. Pit, whose tapping experiments are known to most of us. The Para rubber trees, though some of them were planted on the 16th July, 1877, are not remarkable for their size, owing to the trees having been grown on an old rice field and in association with other products. The eight-year-old trees only measured 3 to $3\frac{1}{4}$ feet in girth; much better growth has been obtained on planted estates, and from figures supplied I have reason to expect a very satisfactory return. The only Para trees owned by Government now producing rubber in Java are to be found at Buitenzorg and Tjipepir. I was agreeably surprised to learn that the Buitenzorg department, not content with their own work in Java, had started an experimental rubber station near Deli, in Sumatra, from which planters in the latter island may hope to reap much instruction and practical help.

Diseases are being closely studied, and so far the most serious pest appears to be *Corticium Javanicum*, a fungus found on nearly every other cultivated product in Java. It is a troublesome fungus, but not dangerous, and can be easily kept in check.

Many tapping experiments are being made to determine the best frequency for tapping and intervals of rest. Many of the trees have been tapped every alternate day for nine months, the pricker immediately following the parer on every occasion during that period. I was sorry to observe that the whole of the bark between the parallel tapping lines, originally twelve inches apart, had been used up. The yield from the eight-year-old trees was 650 grams per tree per annum. This is quite satisfactory when the tapping area each year is only over one-quarter of the basal area.

I was interested to learn, especially in view of the results obtained at Henaratgoda and published a couple

of years ago, that the Buitenzorg experiments indicate the highest yield of rubber per unit of bark excised, from the half-herring-bone system, as against the full-herring-bone and spiral systems. Dr. Tromp de Haas appeared inclined to think that the short V cut would be still better. It certainly should give a higher yield per square metre of bark than any other system because there is so little bark cut away. I cannot, however, regard the V system as being systematic; the lines of adjacent V's draw on the same area after a very short time; they prevent regular paring from above downwards throughout the length of the trunk, and the apex of each V is apt to turn up in dry districts. I should not be surprised to see some planters giving it another trial. Such a development would be a very natural reaction after the drastic methods adopted on some estates.

Importance of Latex to the Plants.

It will interest all rubber growers to learn that numerous experiments are being made to determine the importance of latex to the plant, the effect of removing large quantities from mature trees, and the origin of caoutchouc. The difficulty will be to extract latex without injuring the cells of the cortex; the removal of bark in tapping operations has already been shown to affect the natural foliar periodicity and so reduce the size of the seed. What the effect of removing latex and nothing more is, no one knows at the present time. Let us hope that Dr. Tromp de Haas will on the occasion of his visit to the London Rubber Exhibition in September next, be able to inform us of the results of these and other experiments now in progress.

Will Gutta-Percha Cultivation Pay?

Gutta-percha is obtained from the stems of *Palaquium* species; small quantities are also being secured from the leaves. The plants of this genus, though not indigenous in Java, grow quite as rapidly as in Ceylon, and probably as quickly as in their native areas. But at the best the growth is miserably poor. I saw the trees which were planted on the 8th February, 1884; many of them were only about twenty-four inches in girth, though the giant

of the block measured $5\frac{1}{2}$ feet in circumference at a yard from the ground. The trees have been tapped on the single oblique and herring-bone systems, and also on the half-circle horizontal plan. Every effort has been made to procure good yields from these old trees. The cuts have healed very badly, and the yield only averaged 89 grams per tree per annum. With gutta-percha out of fashion, a wait of fifteen to twenty years, and a yield of about one-fifth of a pound per annum, I do not see any reason why the Dutch Government should be envied. Even if the price of the raw product should show a big rise it is doubtful whether the cultivation of *Palaquium* will ever be as remunerative as *Hevea brasiliensis*. The Government Plantation is, according to information locally obtained, about 1,500 acres in extent; a block of the same size and age of *Hevea* would have placed the island of Java in quite a different position to-day.

Rambong and Castilloa in Java.

Favourable reports of the profits from either of these species have not yet been given to me, and I doubt whether Rambong or Castilloa, even in Java, will beat *Hevea*. The Dutch take a very conservative and cautious view of all cultivations, and regard Rambong as one which will give remunerative but small yields for many years to come. They do not despise it because it is less tempting than *Hevea*; they encourage its cultivation where *Para* will not grow, and believe that from plant sanitation reasons alone it will ultimately be recognised as useful. Castilloa, they admit, is not as hardy as *Hevea* or *Ficus*, but they are content to cultivate it so long as it yields a profit. Java certainly has plenty of gutta and rubber trees of all kinds at its command, and in the event of unforeseen difficulties may benefit very materially thereby.

Government Plantations and Experts.

One cannot suppress his admiration for the splendid organisation, under the direction of Dr. Treub. Every industry is represented by distinct plantations and experts, and much useful agricultural knowledge is published from time to time. Contrast the Java Agricultural Department with those in the Straits Settlements, Federated Malay

States and Ceylon, and you cannot help concluding that the officials in our English departments are saddled with far too much work. One official has very often to take on not only rubber, but coconuts, tea and coffee, and develop the economic, systematic, mycological and entomological sections in every one of them. Java may, to some extent, have followed Ceylon in taking up new products; but the fact that it now retains its sugar, coffee, and cinchona shows that it is better able to improve its cultivations than many other countries. The results obtained with tea and coconuts, as well as with those products just mentioned, are better than those obtained in Ceylon. This being the case, one is apt to contemplate on the future position of the new industry—rubber—and to question whether, though Java has commenced planting on a large scale after Ceylon, the histories of the other products will or will not be repeated.

Java (?) in Thirteen Days.

Java is a fairly big island. When I informed my friends that I must see and leave it within thirteen days they pronounced the feat as impossible and absurd. I agree with them. But when your travelling companion has served the island for 16 years, knows where motor cars can be secured, and has friends who only need to be wired to to send down their best horses and traps, the impossible task becomes less formidable. With Mr. Noel Bingley as counsellor and friend, the feat was accomplished, and to him and the good people who provided for us I now tender my thanks. I left Java with a longing to see more of it, its agriculture, and its people. My impressions are quite distinct, but in order to indicate their value I deem it advisable to give a rough sketch of the parts I visited. I travelled through a part of Batavia, and saw the Botanic Gardens previously referred to. I then proceeded through the Preanger Residency, so well known for its tea, and inspected the properties of the Hevea Rubber, Straits-Java, and Langen Rubber and Coconut Companies; and also Bantaradawa and Bandjarsarie Estates. The next Residency was Banjoemas, where I saw the young Kalu Minggir plantation. We then made straight for Soerabaja, which formed our

centre for estates in the Kediri, Pasoeroean and Besoeki Residencies; in these districts I had excellent opportunities of seeing the properties of the Sengon Rubber Co., Java Rubber Plantations, and Bannarah, Braggah, Soembermas, Soeko Koelon, and other estates. Altogether I went through seven Residencies and over about one dozen estates. Not much, but quite enough. I travelled by night on horseback through forests and over slippery, steep roads; without lights and in wet weather. I journeyed by motor, at night, through a real tropical rain and thunderstorm, and for the first time heard the dull, prolonged reports from well-known volcanoes. I have seen my horse fall through a rotten, plaited-bamboo raft, and anxiously watched it swim across a deep river. I have, with much more anxiety, kept my saddle across rivers, which for width, depth and currents were unnecessarily variable. The bitter has been swallowed with the rest.

The Traveller's Privilege.

Of the hotels in Java I have only praise. They are well got up, and everything is done to make you comfortable. I shall not forget with what relish we demolished a promptly prepared "rice table" at Malang; and how readily our wants—and they were many—were promptly attended to at every hotel we stayed at. But of the refreshment cars on the railway and the telegraph offices along the line I have many other stories to relate. There is no pretence at luxury in the refreshment car. You receive a card on which is printed "beefsteak" in response to your order, and you get a seat when you can. The beefsteak is the only meat you get, though the charge is half-a-crown for it, together with the usual vegetables, bread and cheese, etc. One would not mind the lack of variety or quantity, though even on these points I think the Java authorities might at least do as well as the railway people in Ceylon. It is the condition of the steak which appals you. On every occasion I have received a steak perfectly blue in section for want of a little cooking. That is not the way to satisfy a hungry man; at every meal I have had to wait until the meat was re-cooked.

The telegraph line is not perfect. I handed in a cable at one of the principal stations, addressed to friends in London. The whole staff were requisitioned to find out what the charge per word was to London. In the search for information I overheard a remark questioning where London was. Finally, they charged me up just before the train left. At the next station a wire was received asking for five guilders more, because two words were longer than usual. In the evening another telegraphic request for a second five guilders was received, as they had not originally charged for the address. Considering the cost of sending telegrams, one expects better things.

You cannot get through the amount of work you expect to in Java. The trains do not run at night, and double time must therefore be allowed by people in Europe, who are accustomed to doing their travelling by night in sleeping berths. You can only travel by day, except you are fortunate enough to have friends who can lend you their motor cars. Even then you may have to suffer, as we did. We started at 9 p.m. in the evening, hoping to get to an estate by 9 a.m. the following morning, and thus save half-a-day on the express train. But, alas, one tyre went in the evening and the other three in the morning, leaving us at an out-of-the-way station where the morning express was never allowed to stop. We missed a good night's rest and had the pleasure of seeing the morning express from Sourabaya pass us by unheeded. The result of all our investigations is that I am landed with all my note-books full of interesting information, which I dare not give in detail, but propose to publish in a synoptical form.

Labour in Java.

The agricultural industries of Java owe their success to the abundant labour force available; with an insufficient number of native labourers, the rich soil and forcing climate would be of little avail. The Government wisely reserve land for the use of natives. Such a large force requires plenty of food, and must be kept satisfied. Chinese are met with in large numbers in the principal business centres, but they do not constitute such an important item as estate labourers as in Malaya; they are em-

ployed more in general trading. The majority of the estate coolies belong to Java or are from the neighbouring island of Madoera. The adjacent islands of Sumatra and Borneo, and also Malaya, are yearly drawing on the native labour force in Java. This can continue for many years to come without affecting the island under review.

It is generally understood that Javanese coolies are not only abundant, but cheap. Anent the latter, I have a word to say. It may be that, owing to the cheapness of native labour, the authorities find it more economical to employ coolies to carry stones in bags, and water the streets by hand buckets, rather than use horses and carts. But I am not so certain that the average daily cost of a day's labour on an estate is always so phenomenally cheap as reported. The cost is not so much a question of hours employed as work done. Where the task or daily contract system is in vogue, the wages paid are always such as to leave a good margin for the employer; but on other estates, where the average daily rates for children, women and men, are respectively 15, 25 and 30 cents (100 cents equal twenty pence), the cheapness is not so apparent, compared with the costs in Ceylon and South India. It is certainly much cheaper than in Malaya and Sumatra, though even in the latter places the coolies, being indentured, usually do a better day's work than in Java. I have been on Java estates where the average daily cost for all labourers ranged from about 20 to 31 cents (4d. to 6 1-5d.); in Ceylon the average may be taken at about 33 rupee cents per day (5 7-25d.). But I was informed that the districts I visited had opened up large blocks of jungle quite recently, and to that development must be attributed the high daily wages paid.

When, however, one studies the costs of bringing estates into bearing, he finds that they are much lower in Java than most Eastern colonies. This is due partly to the contract system adopted and also, to some extent, to the methods of cultivation in Java. The coolies are nearly all free, and can generally refuse to work for any particular estate. On some properties, however, the proprietors can rely on a certain amount of free labour, according to arrangement. On many estates the hours of work are from 6 a.m. to 12 and 1 p.m. to 6 p.m.; very

often the coolies are paid cash at the end of each day's work—a feature which many planters in Ceylon might ponder over.

My view is that Java has a labour force which for numbers cannot be beaten. It is also cheap in the majority of the planting districts. If ever the pinch for labour is felt, when all the present planted acreages are in bearing, Java will be one of the last islands in the East to suffer; Malay, Sumatra and Borneo will feel the want of labour much more than Java, or even Ceylon.

Land and Soil.

Everybody knows how fertile the soil of Java is. Its richness is due mainly to its volcanic origin. The ranges of volcanic hills are very conspicuous in the Kederi and Pasoeroean Residencies. Some of the old volcanoes are rugged and steep, whilst others have a gentle slope many miles in length. They formed the interesting feature of the country in most of the districts I passed through. There are several well-known companies who have their estates along the sides of volcanic mountains. Their crops are good, and dividends high. In contrast with these are the estates in the Langen district, where rubber is planted on land as flat as a billiard table. Most of the rubber estates are planted on gently undulating or flat land. The water level is usually many yards below the surface, and in this respect differs from Malaya. I have only seen two estates which for their steep slopes approach much of the rubber land in Ceylon. The Java rubber estates I have seen are notable for the absence of stony, rocky slopes, such as one meets with in Ceylon; and for the scarcity of swamps so abundant in Malay.

The soil is, almost without exception, of first-class quality. It usually consists of a dark-red, finely divided loam; sometimes light and sandy, at other times a trifle clayey. It is a volcanic soil on which luxuriant vegetation has been grown for many years. Physically it is often perfect, and chemically nearly so. I have not yet met its equal in Ceylon or Malay. Java has every reason to feel satisfied with its labour and soil conditions; on these two features rests the prosperity of most agricultural developments.

Method of Cultivation.

I have seen Para rubber cultivated alone in Java on properties owned by Ceylon and Straits planters. On many estates the Para has been interplanted among existing cultivation, such as cacao and coffee, or these products have been planted with or after the Para. Some Para plantations are being catch-cropped with tapioca, citronella, lemon grass or groundnuts. It is therefore obvious that Java rubber planters do not rely entirely on Para rubber, but sometimes prefer to adopt a mixed cultivation, such as is seldom seen in any other country. I like to see mixed products on the same ground for obvious reasons; but I cannot help thinking that on many estates in Java it is overdone. Where the same estate has its Para rubber planted through or with nutmegs, Liberian, Java and Robusta coffee, Ceara, Castilloa, cacao, kapok, and other useful trees, the attention of the manager is necessarily diverted to crops other than Para. He will not cut out his nutmegs or kapok trees while the Para saplings are young, and in the long run his estate consists of too many products, few of which have attained perfection; it is a natural consequence on over-planted estates.

The best Para estates I have seen in Java consist of Para alone or Para with a crop of either coffee robusta, cacao, or tapioca. One catch or inter-crop under the rubber saplings is quite enough even on such phenomenally rich soil. The results obtained on Kalu Minggir, Bantaradawa, and the Java Rubber Plantations certainly justify one in advising one or other of these systems.

A feature of all Ceylon estates along hill sides, and even on flat ground, is the draining, the drains being 1 to 1½ ft. wide and deep, and running at right angles to the slope. In East Java I never saw anything approaching this, except on flat, swampy areas. The hill sides are not drained on a regular system, a few water pits being the only receptacles provided to collect the water and prevent excessive wash. The soil is so rich that a little wash may take place without seriously affecting the development of the plants; but surely it is to the interest of all parties to retain as much soil as possible under all conditions. The draining of planted land sweetens the

soil and encourages the circulation of air, water, and plant food. I commend the subject to the consideration of those planters in East Java with whom I stayed. I cannot think that Ceylon is wasting labour and money in draining; it is just as essential for rubber cultivation as for tea.

Another point which struck me somewhat forcibly after travelling through Perak was that in East Java very few sugar estates were planting Para among the sugar canes. A few may be doing this, but I did not see the properties. I rather imagine that, judging from the huge extensions in buildings and estates, and palatial bungalows, that most sugar companies in Java are making very handsome profits at the present time, and do not wish to adopt a mixed cultivation. Sugar cultivation in Java affords another instance of how that island can improve and retain its crops. Its neighbours in the East are considering the abandonment, or have already given up, the cultivation of sugar; but Java continues to grow it, and now derives a very large revenue from this crop alone.

Growth of Para Rubber in Java.

Para rubber in Java is being mainly grown from sea-level up to 1,000 feet; there are estates up to 2,200 feet where this species is flourishing, but they are not very numerous. In many Para districts there is a marked dry season of many months' duration, and in others a more or less continuous and abundant rainfall. Estates I visited had an annual rainfall of from 70 to over 200 inches; the dry period lasting three to five months in each year. The majority of the plantations are young, extensive clearings dating from 1905 and 1906. I saw some well-developed five-year-old trees on Soembermas and was informed that older trees were to be seen on Passir Oet-ting and other estates. The exports of Para rubber from Java will not be very great this side of 1912 or 1913. A few estates planted in 1906 and maintained in Para alone will be harvesting their rubber in 1912, but others interplanted with various crops will be a little later. The profits made from catch crops under rubber in Java are sometimes enormous, and pay for all development subsequent to clearing. The estates can therefore afford to

wait a year or so longer for their Para trees to come into bearing.

I fully believe that the growth of Hevea in many parts of Java can be as rapid as in the best Selangor districts, and in a few instances it is second to none. But on most of the estates I visited the growth was not what I expected it to be from considerations of the climatic and soil conditions prevailing. The less rapid growth can, I believe, be partly explained by the intercropping, absence of drains, and prevalence of weeds, which characterise the properties I refer to. The system adopted is a very safe one, and is sometimes cheap; but it does not allow the Para trees to develop as rapidly as they might do in such ideal soil. When one has a soil on which coconuts can be brought to the productive stage in five years, and tea crops average 800 lb. per annum, he has some ground for expecting the Para trees to grow at the rate of six inches in girth per annum. I was shown some trees, reputed to be five years old, which girthed 32 inches. Such growth should be the rule, and not the exception in Java.

Seed Selection in Java.

It was to be expected that Java planters would wish to select only the best seeds for their Para rubber estates; they have, from past experience, been taught how important seed selection is in tropical agriculture. I was therefore not surprised to read a translation of a circular issued by the Chairman of the Ned.-Ind. Planting Syndicate in which the desirability of selecting seed for this year's planting was suggested. The circular was issued in consequence of a very suggestive letter received from a member of the Syndicate's committee. The letter, freely translated, was as follows:—

“Up to now practically all the Hevea seed planted in Java in recent years has come either through agents or direct from Straits estates. There has been no question of choice of seed trees for Java planters. Further, the cost has been high, and the seeds for the most part have been very slovenly packed.

“Although it is clear that experience has not yet taught us which of the various kinds of Hevea should be adopted for seed parents, it appears to me that trees of which

the sap has shown specially good composition, and for some years have yielded good results should primarily be selected as seed parents.

"Up to date Java planters have been liable to receive seed from inferior trees; the best seed has, perhaps, been retained for local use, or because it is not desired to send seed to competitors. Hitherto Java planters have had to be satisfied with this position because the available quantity of seed was limited, but it can now be safely assumed that seed production is far in excess of the demand.

"Could not our Syndicate arrange for Java planters anxious to lay down new plantations in the coming west monsoon to send out a reliable man to the Straits on joint account to be present at the collection and shipment of the seed?

"Before going further with the matter it would be well to enquire from Buitenzorg, and also the Experimental Station at Salatiga, for instructions."

Straits and F.M.S. planters, please note that you have been charging too much, packing your seeds badly, and sending seeds from inferior trees to Java! I consider that those insinuations should be backed up with examples, and I look forward to the Ned.-Ind. Syndicate for some information on these points.

The circular is a bit of a jumble. First it refers to *selection of seed parents*, then to the desirability of sending a man out to be present *at the collection and shipment of seeds*, and finally that they should take the advice of the botanical authorities. I give it as my opinion that if they had done the last first the circular would not have been written. Let me explain one or two points. In the first place, the presence of a planter "at the collection and shipment of seeds" would have no effect on the seed parentage; even if he had selected trees for seed, he could not very well run after the seeds scattered by the explosion of the fruits of Hevea. In the second place, to select seed parents would cost hundreds of pounds; it would be necessary to control pollination so that only the best parentage, on both sides, was secured. The female flowers on one tree may be fertilised by the pollen from young trees on the next estate. Except you are able to hand pollinate the flowers, as with vanilla, you will have

to cut down all the inferior Para trees in the district and reserve only the few selected trees for seed supplies. That would be a costly, though necessary, piece of work.

The best that Java planters can do is to make certain that their seeds are from old trees which have been lightly tapped and proved to yield abundance of rubber; select the widely planted areas, free from disease, on such estates, and you cannot go far wrong. There are plenty of estates with old, widely-planted, good-yielding trees, such as Vallambrosa, Bukit Rajah, Highlands and Lowlands, Pataling, Selangor, Anglo-Malay, etc., which give a guarantee. There are millions of seeds to spare, and Java can have the best of them, despite the absurd suggestion in the letter under discussion.

Java and the Rubber Exhibition.

The planters are taking an active interest in the forthcoming London Rubber Exhibition, though beyond showing small quantities of rubber and gutta-percha their exhibition must necessarily be of an illustrative character. Dr. Treub is to take the chair at a meeting to be held at an early date, and our readers will be duly informed of the programme decided upon.

Sumatra Ahead.

I left Batavia at 11.30 a.m. on May 19th, on the s.s. Van der Lyn, bound for Belawen-Deli, where we were due to arrive on the morning of the 23rd. Everybody is aware how hot and moist it is in the Java Sea and Malacca Straits, but very few know how to meet the oppressive atmosphere so well as the officers on board. It is the first boat on which I have travelled where the authorities have had the good sense to arrange for all meals on deck. The innovation met with the sincere approval of all the passengers, and I only wish we could live in the same way this side of Suez. It is warm enough on deck, but it is unbearable below.

Sumatra Rubber Districts.

My first tour was through the Langkat Residency, where I inspected Blankahan and Soengei Roean Estates, owned by the Langkat Sumatra Rubber Company; Soengei Gerpa Estate, the property of the United Langkat

Company; Glen Bervie Estate, near Tandjong Poera. Between these centres I passed through many other coffee and tobacco estates, where the whorled stems of Hevea were visible.

Next came the Serdang district, the home of many London rubber companies. In that Residency I had the pleasure of going over Sialang, Soekalowi, and Baloewa Estates, and had excellent opportunities of seeing Bangoen Poerba, now owned by the United Sumatra Rubber Company, and the Kotangan, Liberia, Sungei Karang, Timbang-Deli, Batu Ginging, Tandjong, Kassan, Deli-Moeda, and numerous other estates, the names of which I dare not attempt to spell.

These districts finished, I journey from Tebing Tinggi railway station by motor to Gamboes, and during that journey caught sight of Laut Tador and Mendaris Estates, with fine blocks of *Ficus elastica*. Along this road I saw some clearings of Para rubber which stretched for several miles over beautifully flat land parallel to the main road. I then left the main road and went forward into less populous but equally fertile lands in the vicinity of Bandar and Si Antar. I there met Mr. Jut, and saw his fine young rubber estate—Soengei Mangke. During these tours I met planters from many parts of Sumatra, and was much impressed with the activity displayed throughout the East Coast in rubber cultivation. I saw some two dozen rubber estates in all, and left Sumatra on June 3rd for Penang, well satisfied that some day the Dutch East Indies would contribute their fair share of raw rubber to the markets of the world.

Cultivation in Sumatra.

The cultivation of plants in Sumatra is limited to the low-lying lands near sea-level, and thereby resembles Malaya and differs from Java, Ceylon, and Southern India. The soil is very similar to that in Java, being light, fertile, and mainly of volcanic origin. You never see anything resembling the stiff blue clay of Malaya or the rocky slopes of Ceylon; everywhere the soil is finely divided and porous, and grows most magnificent crops. The sugar of Java, and the tea and cacao of Ceylon, are replaced by extensive plantations of tobacco in Sumatra.

Exactly why Java takes so ravenously to sugar and Sumatra to tobacco, though each country could grow both products very well indeed, is difficult to explain. The only product which is commonly grown on European plantations in Java and Sumatra, to a large extent, is coffee. In both countries the coffee estates are being rapidly interplanted with Para and Ficus rubber trees.

Rambong Rubber.

I have seen more *Ficus elastica* (Gutta Rambong) in Sumatra than in all the other countries put together. Large estates exist each with thousands of mature trees. Planting on old tobacco and lalang lands is still going on, and every campo-eng is planted with this species and no other. You may keep near civilised areas within reach of the train, or you may travel into the interior, where only Batoks have their villages; everywhere you will meet with Rambong trees, many of them of enormous size. The trees are not only growing; they are being tapped, and most of them over seven years appear to be yielding over 1 lb. of rubber yearly. From my experiences in the Dutch East Indies, and especially in Sumatra, my respect for Rambong trees has been changed. I no longer despise that species on account of its poor yielding qualities. If I could only feel certain of a remunerative price for the pure raw rubber, I might be tempted to plant it in districts too dry for Para rubber. Where *Ficus* plantations exist alone and there is plenty of forest suitable for Para, it would be sheer waste to neglect or fell the *Ficus* trees. I would only recommend the removal of Rambong trees when they interfered with the natural growth of adjacent Para trees. The fact that eight-year-old trees in Sumatra have given $1\frac{1}{2}$ lb. of dry rubber per tree, costing 40 guilder cents (8d.) to collect and deliver at the factory, should not be forgotten by Para enthusiasts.

Para Cultivation.

Para rubber cultivation in Sumatra was not commenced in earnest much before 1906, and I do not think manufacturers can expect many tons of rubber from that island before 1913 or 1914. A few estates, such as those owned

by the Langkat Sumatra, United Sumatra, Sumatra Para, and Amsterdam-Langkat Companies, possess several thousands of old or tappable trees. Most estates, however, consist of coffee interplanted with Para, or old tobacco lands planted up with Hevea, during the last two or three years. There are very few estates consisting of Para trees alone, and in this respect Sumatra comes into line with most other countries.

Most people have the idea that phenomenally rapid growth is to be seen in Sumatra, the Para trees being reputed to increase in girth at the rate of six inches per year. I have certainly seen trees which have grown at that rate when planted alone and on virgin land, but most estates I visited could not generally lay claim to such rapid developments. The well-known Sumatra rubber estates have nearly all been developed out of coffee plantations, and the growth of the Para trees thereon is not what it might otherwise have been. Coffee bushes, especially when old, do keep back the growth of the Para trees. At the same time they give a crop which enables the directors to pay a dividend from the beginning, or materially reduce weeding expenses during the first five years. The growth of the Para trees is most rapid when planted alone, next best when planted at the same time as the intercrop, and slowest when in old coffee or on old lalang and tobacco grounds. I should put the circumferential rate of growth in Sumatra at six, five and four inches respectively, on lands included in the three categories enumerated above. It is very dangerous to generalise in this way, especially when the trees are scattered over the Serdang, Langkat and Asahan districts, but I think the above conclusion will be found to be approximately correct in most instances.

Effect of Rubber on Other Cultivations.

On many estates the effect of rubber cultivation is quite obvious. Sooner or later the Hevea and Ficus trees must alone be in possession of the land. As in the low-country tea lands of Ceylon and the sugar estates of Perak, the Hevea and Ficus trees, with increased age, demand more soil. In Sumatra and Java the coffee estates interplanted with rubber will soon be transformed

into purely Para or Rambong propositions, and except new lands are planted, the machinery used in the preparation of coffee will be useless. In districts like Serdang and Langkat the change will be great, owing to the very large acreages now under Liberian coffee. In five years' time the appearance of these two Residencies will be completely changed, and for the first time a forest cultivation will reign.

Lalang.

On neglected estates the tall, narrow leaves of that much-feared weed—lalang—soon make their appearance. Tobacco lands, after being cropped, are allowed to develop in lalang and secondary growth. The same happens with the sugar lands in Java and Perak. Whether the frequent sight of lalang has dulled my sense of fear I know not, but I certainly must admit that I no longer look upon it as the terrible weed against which organised effort is of no avail. I have seen thousands of acres of Para rubber developed on old lalang grounds and now thriving exceedingly well. Many planters are to-day selecting such land for rubber on account of the absence of tree stumps in the soil and the relative immunity from the root fungus and white ants which such a condition gives. There is usually nothing wrong with the soil except that a crop of tobacco or sugar may have been taken from it in past years.

On flat land I have seen an American steam plough used to turn the soil over and bury the lalang. This seemed to me to be the wrong thing to do, but as the lalang was kept in check at a cost of two guilders (3s. 4d.) per bouw ($1\frac{1}{2}$ acres) per month during the first year, and at a nominal cost subsequently, I could not seriously complain. On other estates the land is kept free from weeds along the lines of the rubber trees to a width of six feet, and the lalang between the rows smothered with kratok, or the wild passion flower. The power of these trailing weed-killers is remarkable, and I anticipate that their use will be much more frequent when once the results obtained are better known. If the estate has to be clean weeded and is completely under lalang, it will cost at least two guilders per month per acre for the

first year, 1½ guilders monthly for the second year, and one guilder for the third and fourth years. Compare that cost with the combined cost of felling, clearing, burning, and weeding on an ordinary estate developed from forest. Lalang does not come out as badly as the average rubber investor imagines.

I do not for a moment wish it to be thought that I *like* lalang. I wish it were not in existence, and strongly advise that every effort be made to prevent it from getting a hold on any planted estate. But from what I have seen accomplished in Java, Sumatra, and Perak, on lands originally possessing only lalang, I no longer regard it as a weed beyond the control of the planter.

General Conditions.

Most estates are supplied with Javanese coolies for coffee and rubber, and Chinese coolies for tobacco; a few Malays and Tamils are occasionally to be seen. The Javanese coolies cost about 70 guilders each, half of which is recoverable; a further advance, the whole of which can be recovered, is usually made to the coolies when they arrive on the estate. The coolies, though indentured for three years only, usually enter into a further contract, and in some instances make Sumatra their home. They are well provided for on the estates, and are visited by inspectors who enquire into the daily tasks set them, their house and hospital accommodation, etc. The cost of managing estates in Sumatra is high, but many tobacco companies manage to pay dividends approaching to, and sometimes exceeding, 100 per cent. Europeans are highly paid, the cost of living necessitating high salaries and substantial commissions.

The local train service is only fair; berth accommodation for travellers doing long journeys is certainly required. The main roads are good, and motoring is, or can be, a pleasure. In addition to Dutch, there are numerous Swiss, German and English managers of estates; in the Serdang and Langkat residences there are many English interests, and, if I mistake not, these are likely to be considerably increased in the future.

Method of Planting.

As most readers of the "India-Rubber Journal" know, fresh seeds, basket plants, or stumped seedlings from the nursery may be used in planting up an estate. The stumping of nursery plants is a very drastic operation, the foliage and green parts above ground, and also the lateral roots and part of the main or tap root, being deliberately cut away, leaving a thin rod of living material similar in general appearance to a straight walking stick. This simple structure, the lower part of which is root and the upper part stem, is put into a recently re-filled hole, in wet weather, and allowed to throw out roots and leaves as well as it can. It is a marvel so many stumps survive and grow into such enormous, healthy, trees. Most of the nursery plants are, when thus operated upon, less than twelve months old, but I heard of several three-year-old plants being stumped and planted with such success that a visitor to the estate at a subsequent date put two years on to the age of the plantation. But whatever the appearances of such a property may be, it is as well to remember that the plants have not got either the lateral root system or main tap root which they naturally possess and require. What white ants would do with such plants may be conjectured.

Planting from nursery stumps is sometimes the only system possible, but if I were planting my own property it is the last method I should think of adopting. The results which have been obtained by the use of basket plants—seedlings reared in friable, loose, baskets for two or three months, and planted in the field without destroying or even disturbing the foliar or root structures—are magnificent, especially when compared with those obtained from stumps. There is a minimum number of vacancies and less likelihood of encouraging white ants, borers, and fungi when basket plants or seeds at stake are used; the cuts, bruises, and dead parts on stumped seedlings are sources of danger.

The splendid growth obtained on rubber estates planted with basket plants has attracted attention even in Europe, one firm having gone to the trouble of ordering a trial consignment of empty baskets from Ceylon for use on their West African plantation. If the baskets, which

are not procurable in West Africa, can be delivered at the latter place at a reasonable cost, they will be extensively used on the rubber and cacao estates now rapidly springing into being in that part of the world.

I would recommend this to some Sumatra planters who do not believe in anything except stumps, the roots of which they cut down to about six inches. Stumping is a method to fall back upon, and should be regarded as such.



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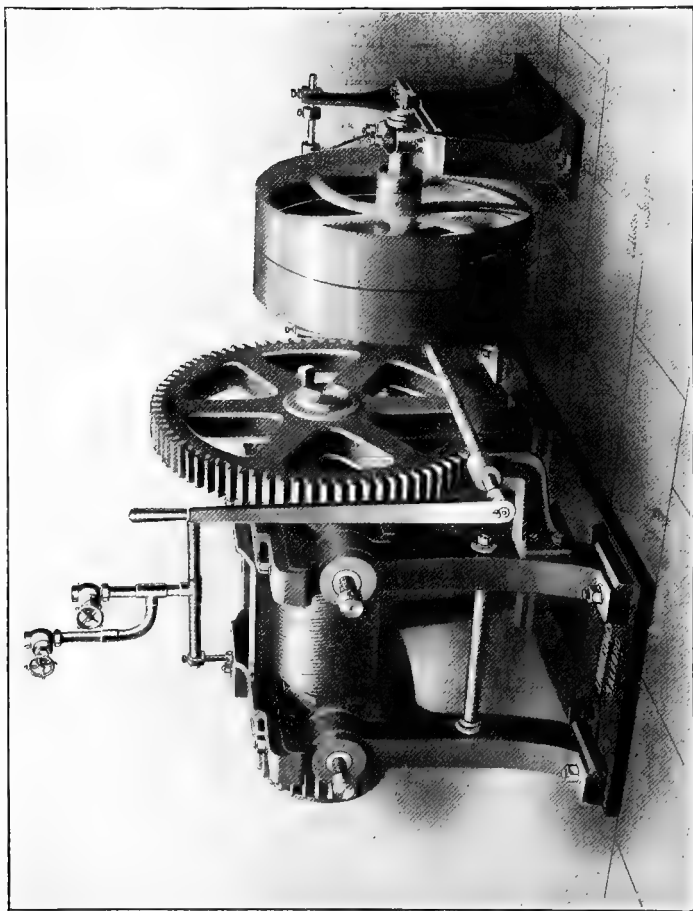
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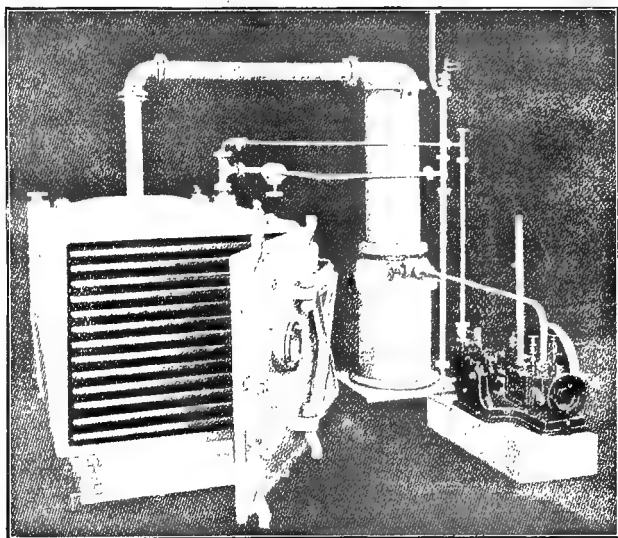
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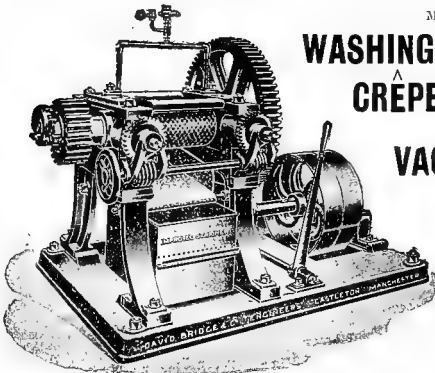
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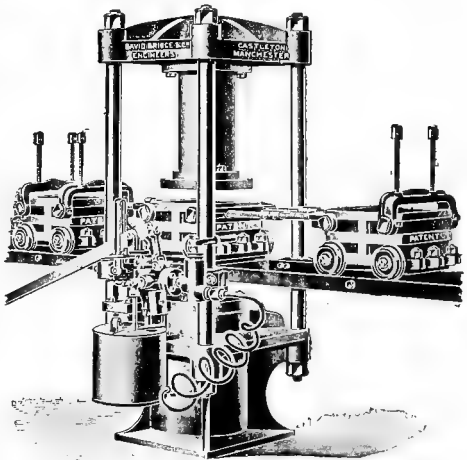
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